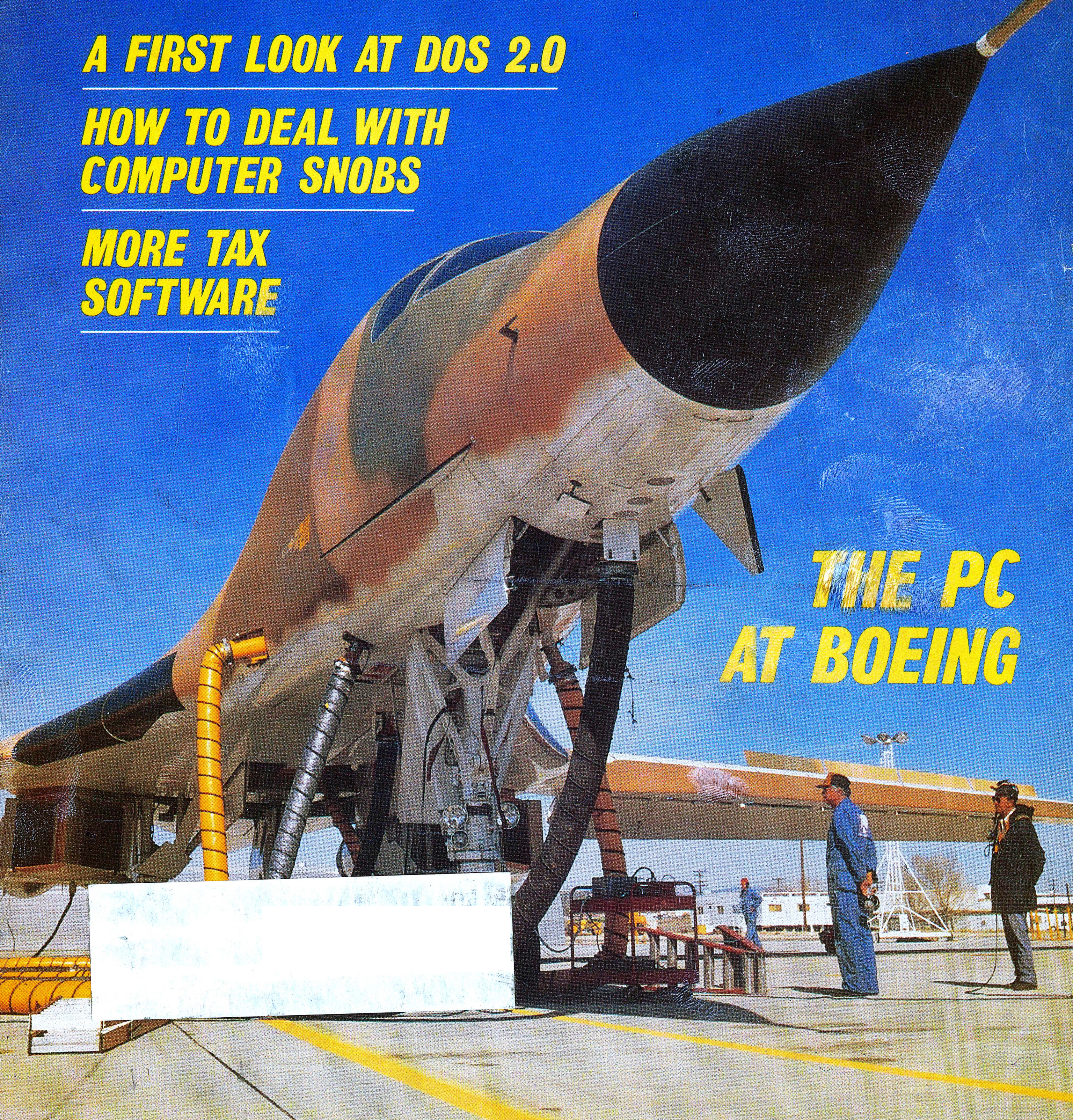
April 1983 Volume 1 $2.00

softalk

for the IBM Personal Computer



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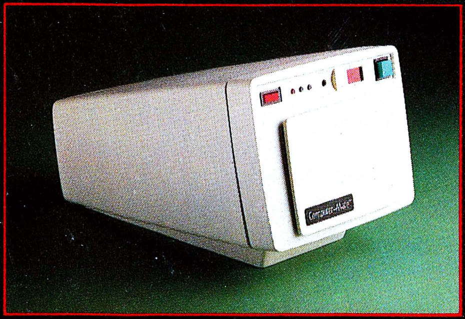

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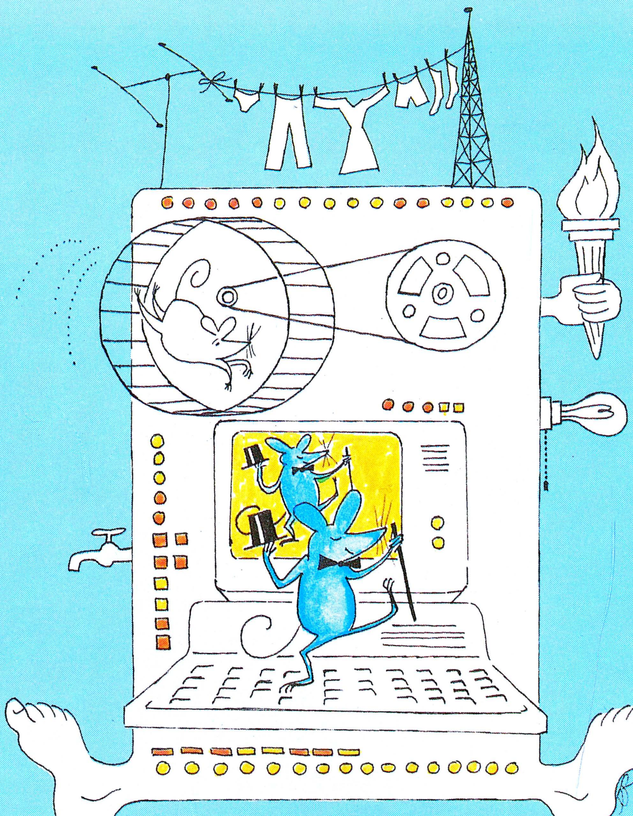

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Those computers and others are described beginning on page 106 of this issue. If you want to claim this month's prize, you'll have to invent your own.

The challenge, in brief, is to describe for us the raunchiest, rattiest computer you ever *might* have owned. (Real computers don't count!) You can try as many times as you like, but no description should exceed five hundred words, and all entries must be received no later than May 15, 1983. Type or print each entry double-spaced on a letter-sized piece of paper, attach an entry form, and send it to Snob Computer, c/o Softalk IBM, Box 60, North Hollywood, CA 91603.

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The Calc War Has Just Begun!

crosstalk

Cleveland Demurs

I was reading the February issue of *Softalk for the IBM Personal Computer* and wondering how a decent computer magazine could be distributed to subscribers for no charge. Then I ran my eyes across a box on page twenty-seven, entitled "Psst! Have we got a deal for you!" I found out why it's free.

Boring little jokes about the status of Cleveland, Ohio, have just about made me sick. I am tired of California airheads making jokes about our weather, our location, our population, our economy, or anything else they find to rank on. I figure that it must take subpar intelligence (or a complete lack of judgment) to include offensive remarks like this in a supposedly "professional" journal.

So you won't come to Cleveland? Well that's fine because we already have enough garbage here. But one day when the California beach boys have drained Lake Mono into a crusty mud hole and you're stumbling around trying to find a puddle to bathe your sun-struck eyes in, I may see you on your knees begging for a chunk of my frozen, dirty lake. And you won't get it. So keep this magazine if you want to; I know now that I'll never pay for it.

Brian E. Jeffreys, Cleveland, OH

Rosy Redress

Nancy Andrews's column, Questions and Answers, referred readers to a product called *ProKey* by ProSoft, which makes it easy to type the extended ASCII codes available via the IBM pc keypad. I'd like readers to know that our company has changed its name. We are no longer ProSoft; as of late January, we are RoseSoft. Our address remains unchanged.

David Rose, RoseSoft, Seattle, WA

About the Most Popular Poll

Let me preface my choices with a little background. I am a senior financial staff accountant with the largest public accounting firm in the free world. My firm has made the commitment to use the pc in its field practice. We have at this time over fifty pcs in the Houston office (that's about one for every twenty professionals). *VisiCalc* was the primary force that brought the machines into the office and is still (after one year) the most widely used application. I have had the opportunity to evaluate and recommend application software from the outset. I have had a pc at my home for the past nine months. You'd have to fight me to take it away.

The following packages or programs are my favorites, in descending order, of all those so far released:

1. *WordStar/SpellStar*—This combination allows the ultimate in "cut and paste," and since none of the professional staff can type (or is it now "keyboard"?) worth a d– –n, *SpellStar* is a godsend for the support staff that comes along behind the first draft for technical corrections. The interface with the DisplayWriter through *PC-Talk* creates the near-perfect circle in the office environment.
2. *PC-Talk*—This is absolutely the most "user-friendly" (I hate that term) application program that has come along this year. It has taken an extremely complex area of personal computing and put it so that even my managers can feel comfortable with file transfers, even to a few stray Apple IIIs around the office. Thank you, Andy.
3. *VisiCalc*—This is a program that the microcomputer owes its boom to. Virtually every professional in the firm (including those in the UK and North Africa) has been exposed to it; most swear by it. Have to be careful, though, that they don't try to *VC* every application that comes along. The program is outstanding. However, as the models are being built to the maximum at this point, I am looking for a replacement. *MultiPlan* may help. *SuperCalc* is just confusing to the seasoned *VC* user. *MBA* is too cumbersome.
4. *dBase II*—This application program is quickly growing in popularity. I will not use the editor, and wish I knew how to remove it. It is otherwise the best in its category.
5. *EZ.BAT*—You'll only find this set of file-handling programs around the firm and a few of the Houston area client offices. Try it, you'll like it.
6. DOS 1.10—This is the best bargain of any of the programs that I use. Oh, it does have a few drawbacks, but could you operate without it? BasicA is worth the price alone.
7. *StarTrek*—After a long day downtown, fighting a few Klingons and the occasional Romulan is a welcome diversion. I use it to introduce many friends to the pc.

I will take the liberty to lambaste the software that I have (tried) to use during the past year. I hope that these comments count as negatives for anyone that doesn't know any better.

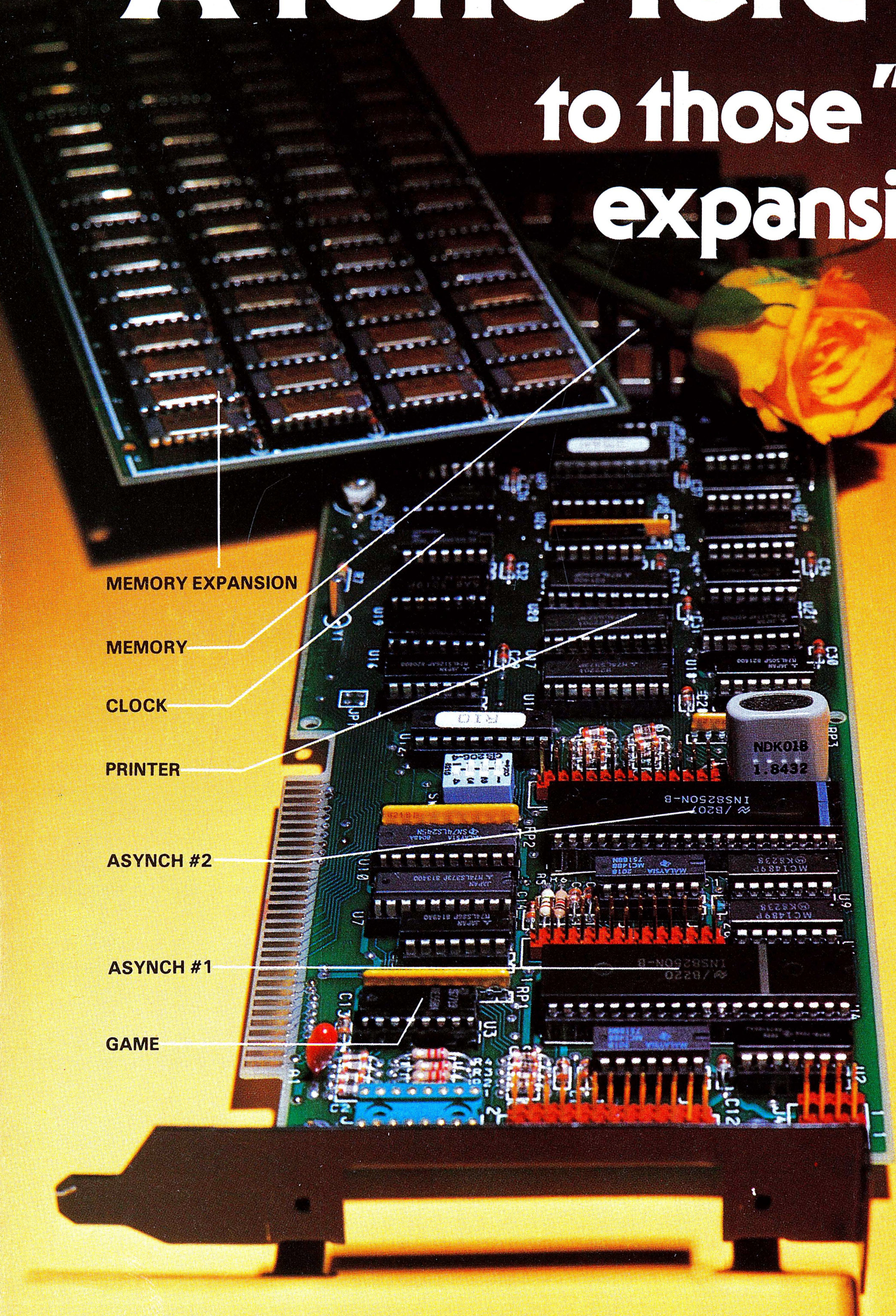
1. Peachtree *General Ledger*—Totally a pain in the butt to set up, much less try to use. It's either their way or not at all, which I can't accept.
2. *Time Manger*—This might be okay if you had a dedicated machine, but then it's not a multiuser system. Stay away.
3. CompuServe—This network (it is a program, is it not?) was the most frustrating piece of the personal computer scene to figure out. Save for the CB section (which is the best pornography available tonight), the service is poorly documented and, I feel, a disservice to the future of personal computing.
4. *Eliza*—I might not have rejected this one if I had not examined the source-code listing. She was more interesting with her protective clothes on than seeing her with them off. I refuse to show the code listing to friends, lest I spoil their appetite.
5. Comm.bas—This program on the DOS diskette is a decoy in the way of communicating with another system. It is especially bad, since there are no instructions or other forms of documentation. It is the worst form of software available, since it presents itself as a usable tool but only serves to frustrate. Shame on IBM, they know better than to do that. . . .

Bill McCuiston, Houston, TX

Other Comments

Forth Level II from Forth Inc. is a top-notch multitasking operating system. . . . *WordStar* has intersystem portability. . . . *EasyWriter 1.1* is easy to use, has everything I need. . . . *Volkswriter 1.2* is a super editor for *dBase II* programs as well as a darn good word processor; it doesn't get the credit it deserves. . . . The *WordStar*, *MailMerge*, and *SpellStar* combo are the most useful. . . . Update support on *TIM III* has kept it the best investment. . . . *Condor* is much better than *dBase II*. . . . I liked *VisiCalc* until I bought *SuperCalc*!. . . Number five *Personal Tax Planner* will fade after April, but watch for *Snipes*—a great game. . . . *DataEase* is the best complete database system so far. . . . *PFS:File* is very user-friendly. . . . *SuperCalc* the best by far. . . . The best software is what you write yourself. . . . Some club programs, and my own, rank up in the middle somewhere. . . . Many programs, especially games, are in the public domain and as good or better than those being sold. . . . I'm waiting for a good PC-DOS Fortran. . . . Still looking for a decent word processor. . . . A good communications package is needed. . . . Hope for better and cheaper software in 1983. . . . As a professional in data processing, I am appalled at the low quality and high prices of software for micros. . . . I find

A fond farewell...
to those "Big Blue" expansion blues.



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• IBM is a trademark of International Business Machines most software so far is inadequate. . . . MS-DOS's BIOS documentation is terrible! . . . Software people need to work on their documentation. . . . Documentation poor on IBM Pascal. . . . I'll never buy another copy-protected program. . . . VisiCorp's service stinks. . . . IBM should be ashamed of their Fortran. . . . Peachtree accounting severely overpriced! . . . *Adventure* and *Deadline* are more frustrating and dull than entertaining. . . . Worst software I paid good money for: *Pigpen*. . . . CP/M-86 and FinalWord should be scrapped or rewritten!

Multicommentary

To Richard Kaapke: I read with interest your article in the February '83 issue regarding the AST and Tecmar multifunction boards. As a recent purchaser of the Tecmar All-in-One, I'd like to point out an error I noticed.

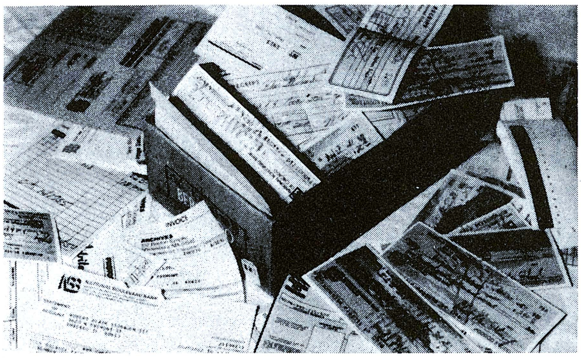
With the purchase of my board, I received extensive documentation and RAM disk emulator software. In your article, I was surprised to read that you hadn't received the same. In my package, the user has a choice of assigning a portion of low or high memory as a RAM disk by running an installation program included with the board. Also, the low-memory RAM disk size can be designated during the installation process. The shortcoming in the AST board concerning the use of the RAM disk that you commented on was one of the reasons I avoided that particular product. The hassle involved in setting up the RAM disk is, I think, silly.

In addition, the software supplied includes two very useful utilities called *Tdir* and *Tcopy*. These deserve some mention. *Tdir* is, obviously, a permutation of the DOS directory command, but allows such things as pausing each time the screen fills with output, displaying system or hidden files, and sorting the directory alphabetically by extension or by the date last written to. *Tdir* also has an option similar to the DOS *Chkdsk*, which provides a little more detail regarding diskette status. *Tcopy* is a little more useful than *Tdir*. Perhaps the best thing about it is that it permits concatenation of files. It also can copy files in binary format, perform a write-verify with each copy, and can copy system and hidden files, another big plus.

Your comments regarding the printer spooler are well taken. I feel it could be a little more sophisticated myself. Another fault I found is with the portion of the documentation that describes the setup of the high RAM speed disk (the necessary switch settings for the board itself and the CPU). I found it somewhat cryptic and unclear. Given the other options, though, the possibility of adding a programmable array logic chip (admittedly somewhat limited in potential mass appeal), and the high-quality construction of the board, I am very pleased with my purchase. I hope you inform other readers of this. It could help those who might be shopping for a multifunction board, given the myriad of those available on the market today.

George S. Richards, Medford, NJ

BALANCE YOUR BUDGET



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Crossed Wires

Regarding the February issue, Joe Juhasz's article and cross-referencer program provides a very useful tool. I have already located and corrected three bugs with this program. It, unfortunately, has a few bugs of its own.

The first bug seems to have been introduced by the typesetting process and can be corrected by:

```
230 GOSUB 1880 ' Initialization
```

The published code does a GOSUB 1800, which branches into the middle of the print loop.

The second bug well might be a combination of typesetting and original error. The correction is to replace one line and add another:

```
1740 LPRINT CVI(F6$);CVI(F7$)
     ;CVI(F8$);CVI(F9$)
1745 LPRINT SPC(17);
```

This eliminates the final semicolon on program line 1740 (which ends the report line being printed from the work file) and adds a new program line to space over seventeen spaces on the next output line of the report. Without this change, the references to those items with more than nine references are printed as one long report line rather than several report lines, each of which contains nine references (except for the last report line, which may have less).

The first bug is easy to find and most will find it either by reading the program or typing it. The second is more subtle and might not be caught until a large program is processed. It was just my luck that the first program I tried was large and demonstrated the error.

Jon C. Stonecash, Coon Rapids, MN

Bargain Assembly

Thank you for beginning to include more technical articles, particularly about assembly language programming. Beginners' Corner is excellent for those who need it, but I am pleased to see you are also now catering to those who don't. The February '83 issue was quite good, and Peter Norton's article was especially good.

I would like to make a correction to Ray Duncan's article. On page twenty-seven he states that there are only two assemblers available for the pc. In fact, there are three. When my budget was so tight I couldn't af-

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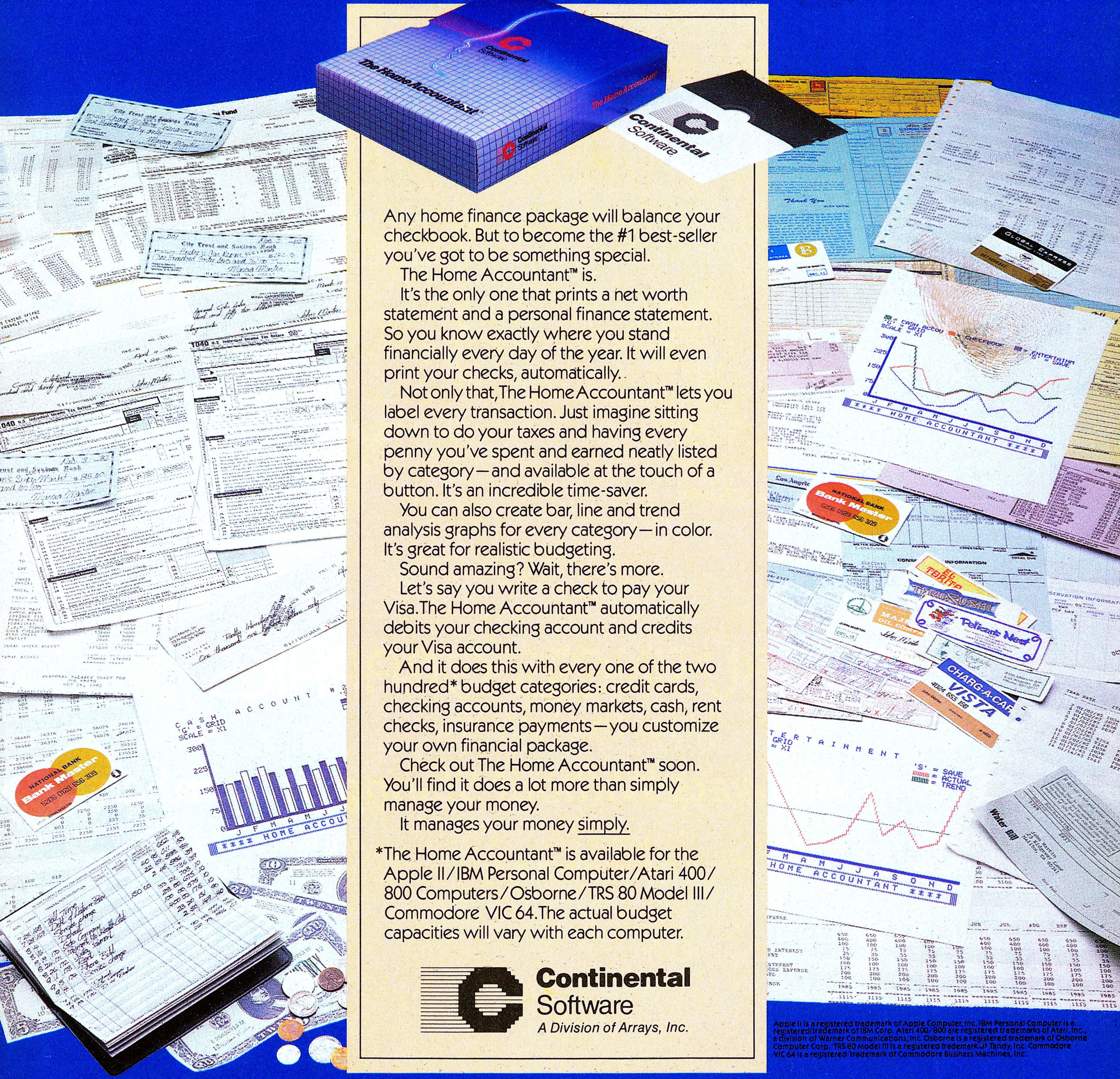

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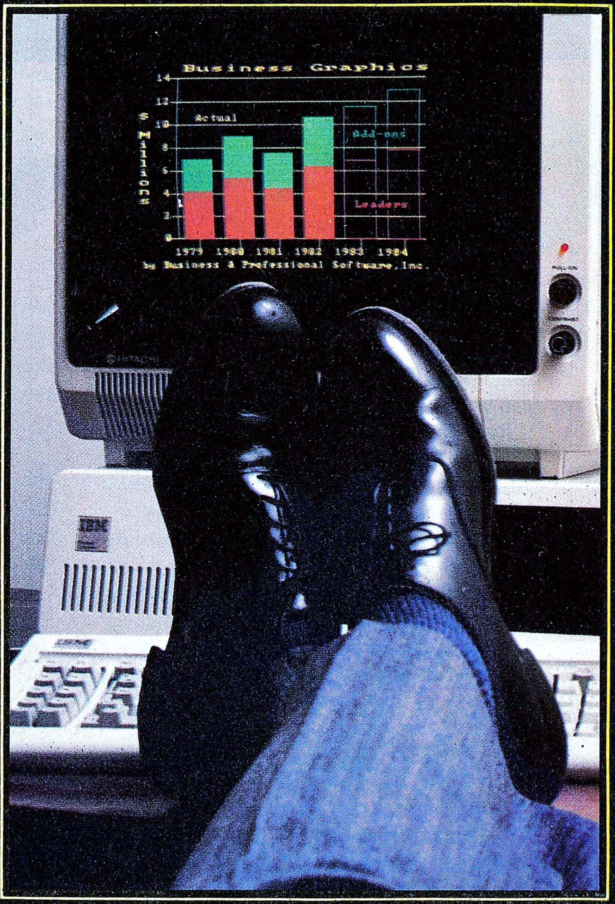

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ford the $100 IBM assembler (along with the extra memory my pc would need to run it), I set out to write my own. ChAsm, my cheap assembler, was the result. ChAsm is a full-fledged two-pass assembler, producing object code in the .COM format. It is written in interpreted Basic, and will run on any pc with at least 64K and one disk drive.

I am now distributing ChAsm under the Freeware marketing scheme. I will copy the program free of charge onto any disk that I receive, provided a stamped return mailer accompanies the disk. Those who try the program and find it useful are requested to send a twenty-dollar donation. Readers may send disks to me at the Department of Chemistry, Dartmouth College.

David Whitman, Hanover, NH

Family Affair

Here's a true story I thought readers would enjoy; it concerns the speed with which a six-year-old child can comprehend and relate to computers. Our family purchased an IBM pc, thinking it would be good for our daughters (aged two, six, and seven) to be exposed to computers early in their lives. Little did we imagine how quickly the girls would assimilate the computer language. We were all at the dinner table, and our seven-year-old daughter Kelly had launched into a long, drawn-out description of her day. Not wanting to listen, our six-year-old, Kimberly, turned to her sister and said, ''Oh, Kelly, just F—10 it!''

You can imagine our surprise—within just three weeks of purchasing our pc, Kimberly had already learned that F—10 means to cancel a program. Now Megan, aged two, is saying it all the time too!

Anthony and Kathleen van Ravenswaay,
Rio Rico, AZ

Casting His Vote

I've now received two issues of *Softalk for the IBM Personal Computer*, and I think it is a terrific magazine. I'd like to put my vote in for more articles like those by John Socha and Peter Norton, which appeared in the February '83 issue. Your magazine is the only one I know of that is making this sort of technical information available at the current time. There is a desperate need for this information. All of us will become better programmers as a result and will thus benefit even more as better and better programs are developed.

Edward F. Kurtz, Jr., Northampton, MA

Fortran Fix

Other users of Fortran-77 in the UCSD p-System will likely also find it somewhat confusing to obtain hard-copy printout in their initial use of this system. I found the description of the use of the printer in the Fortran-77 reference manual inadequate, and I'd like to offer two suggestions for using the printer. First, when compiling the Fortran source program, the p-System main program will ask for an output file for the compiled listing. Hit the return key if you don't want a compiled listing. Enter #6: for listing on the printer. And enter #5:comp.*text* for a file to be created on disk storage (note that ''comp.text'' is merely one suggested name for the file). Second, the Fortran-77 manual appears not to mention how to obtain hard-copy printout from a Fortran program. Achieving printout is relatively simple: the program needs to open, and define the printer as an active unit, with a statement such as *open (6, file='printer:')*. Then direct all write statements to unit number 6 for hard-copy printout.

Barry Edmonston, Ithaca, NY

Informal Filer

I own an IBM pc and am an avid reader of *Softalk for the IBM Personal Computer*. I have no formal computer training, but I have managed to work well in Basic, with the exception of creating and accessing random and sequential data files. Can anyone suggest any good books devoted to disk-file techniques?

E. B. Clark, Escondido, CA

Information, Please

With disks, RAM disks, and hard disks already here (and who knows what's to come), information about copy protection is becoming more important than price. Please restore it to your reviews. Sure, software suppliers are ashamed of copy protection. We'll never see it mentioned in their ads. But if you knuckle under to their pressure, the good guys will be tarred with the same brush. I suspect much of *dBase II*'s success is due to the fact that it's one of the few database programs not copy-protected.

Charles R. Blair, Sr., Townsend, TN

Praise from Sir Hubert

I've had my pc since August '82, and I subscribe to *PC* magazine and *Creative Computing*. I took *Softalk*'s trial offer only because it was free, and I had enough time to manage one last magazine. I never intended to renew.

Well, folks, the February issue has pushed me beyond the point of no return. The articles on monochrome/color switching, Alan Boyd's illumination of the PC-DOS FAT, Peter Norton's ''The Software Interrupt,'' and your Basic cross-referencer program—all in one issue! It was more than I could bear.

Your promise of additional tutorial information, including DOS Assembler, has

Script

Script is the easiest-to-use word processor on the market today.

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Script uses your printer's capabilities, including optional letter quality print. You can justify text, use underlined, bold, or italic typefaces, and use supercripts and subscripts.

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The **Script Users Manual** is organized so you can learn to produce a letter, prepare a resume, or type a report in a few minutes. In a few hours you can learn to process any kind of document using **Script.**

Script requires an IBM Personal Computer with 64K of RAM and one disk drive. A second disk drive is useful. All compatible printers are supported.

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me quite enthused about *Softalk for the IBM Personal Computer*. You were far and away the best magazine in February. I and many of my friends need this technical information, and frankly your competition is way off the mark.

Sam Gerber, Philadelphia, PA

Declaiming Disclaimers

What I must get off my chest at the moment involves the disclaimers that software manufacturers feel they must include with their product. It is obvious that they consider each customer a thief whose dark plans involve making thousands of copies of the software and selling it far and wide at a discount price, thereby bankrupting the manufacturer. To prevent this piracy, the manufacturer copy-protects his software.

Okay, but what happens when the inevitable accident occurs and the program disk is damaged? Simple, just get the backup disk you made when you bought the program and use it. But alas, you didn't make a backup because the manufacturer didn't trust you and prevented you from making one.

Or picture your disappointment when the game disk you sent for arrives in your rural mailbox wet and muddy. Oh, that's okay. Just write the manufacturer and explain. He'll do right by you. But wait—right here in the soaked manual it says: Should your disk be rendered unusable for any reason within one year from the date of purchase, we will replace the entire package for a twenty-dollar fee. Send disk and documentation, postage prepaid, along with proof of purchase.

Note the great trust the manufacturer places in you? And by the way, could you come up with a receipt for every piece of software you own?

Now let's move on to the matter of warranty. From the manual's last page the following fiat is decreed: The software program and enclosed documentation are sold "as is," without warranty as to performance, marketability, or fitness for any particular purpose. The entire risk as to the quality and performance of this software package is assumed by the user.

Suppose I submitted my check in payment for this software with the following "Warranty Policy" printed on the reverse side: "This check is issued 'as is,' without warranty as to its authenticity, genuineness, or value. The entire risk as to the convertibility to cash is assumed by the payee."

Well, is my message clear? How about a little trust? Actually, if the seller does not trust me, why in heaven's name should I trust him? I understand the problem. Were I a producer of software, I, too, would want to protect my product from theft. I, too, would want to gain a fair profit from my effort. But somewhere between the present extremes of draconian disclaimers and copy-protection measures and the folly of native trust there must be a golden mean. I hope the producers of the software that I depend on to convert my pc from a toy to a valuable tool will recognize the merit of my complaint.

Lewis C. Heinzman, Potter Valley, CA

Cave

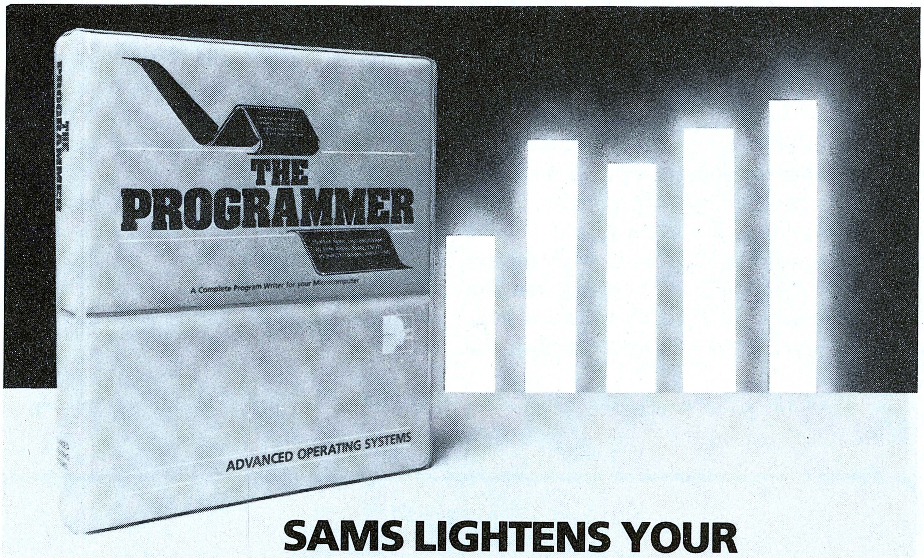
I'm writing because I've got some information that might be valuable to IBM adventurers. After three years I have finally found my way out of "Colossal Cave" with the help of a unique map published by Blackjack Software. Spread the word to fellow adventurers. This map leaves plenty of challenge to the game and is worth twice its $5 price.

Edwin A. Schmidt, Annandale, VA

Oversight Cited

I very much appreciate the favorable review of *Crossfire* that appeared in the January '83 *Softalk for the IBM Personal Computer*. I'm writing to point out that you neglected to give credit to my coauther on the IBM pc version, Frank Randak.

Jay Sullivan, Agoura, CA ▲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tradetalk

SOFTWARE WIZARD

Δ **IBM** (Boca Raton, FL) is expanding the marketing of the pc to include value-added sales organizations. Under one program, **IBM Entry Systems** (Boca Raton, FL) will consider proposals from authorized IBM retail dealers to market to resellers who enhance the pc in function, capability, or both. These resellers typically will market within the local business area of the authorized dealer. The dealers will be responsible for product support and service. In addition, IBM's **Distribution Channels** (Rye Brook, NY) will be authorizing selected regional and national value-added sales organizations to market the pc. These dealers would add significant enhancements within a specific vertical application area, and also supply support and service.

Δ **Peachtree Software** (Atlanta, GA) announced the availability in Britain of several of their packages for the pc. **IBM** will distribute one, and **Peachtree Software International** (Berkshire, England) will distribute four others. *Peach Calc* will be marketed under the name *Financial Modeler*, and the *Business Graphics System* under the name *Colour Graphics*. Peachtree International expects the release of the pc in Europe to increase sales dramatically and has added fifty people to their British headquarters.

Δ *Star Warrior*, a science fiction adventure game from **Epyx/Automated Simulations** (Sunnyvale, CA) has received the "Best Science Fiction Fantasy Computer Game" of the year award from *Electronic Games* magazine. Twenty-seven categories are represented in the annual awards, including eight categories of computer game software.

Δ **General Electric Information Services** (Rockville, MD) has signed an agreement with IBM for ten million dollars' worth of Personal Computers. The micros will be made available to GE Information Services' clients as part of an integrated applications program that combines its worldwide teleprocessing network, central processing, and databases with local processing facilities. GE also will provide access to its network to clients who have other microcomputers, initially the Apple and the TRS-80.

Δ **Alpha Software** (Burlington, MA) welcomes **James Gerow,** formerly an aerospace engineer who helped develop software for the NASA Skylab, Apollo-Soyuz, and Space Shuttle programs, as the company's new vice president of software. Gerow will manage development of new software by in-house programmers and freelance authors. Product testing and verification will also come into his realm. Also new at Alpha is **Selwyn Rabins**, formerly of Chase Econometrics/Interactive Data, as company director of finance. Rabins, 30, will act as controller in addition to working with outside investors and getting involved with acquisitions. He has ten years of experience in high technology and will assist in the company's national sales program.

Δ Four staff members at **Franson and Associates Public Relations** (San Jose, CA) were promoted recently as part of a major reorganization, according to Paul Franson, agency president. Recognized were **Penny Pence Anderson, Susan A. Thomas, Karen R. Brown,** and **Gina Burr**. The company provides public relations and communications counsel for companies in the electronic, computer, communications, and biotechnology industries.

Δ Dramatically increased revenues have prompted **Datamac Computer Systems** (Sunnyvale, CA) to relocate to new facilities, providing five times the production area. According to president Dick Andreini, the move results from sales that have risen from one hundred thousand to five hundred thousand dollars per month over the last six months. Sales are expected to double again over the next six. The company's new address is 595 Pastoria, Sunnyvale, CA 94086.

Δ **Hayden Books** (Rochelle Park, NJ) has named **Douglas McCormick** and **Christopher Varley** as computer science acquisitions editors for the company, as part of a major expansion into microcomputer book publishing. The two will be responsible for finding new computer science authors and guiding their manuscripts through publication. McCormick is "looking for manuscripts dealing with programming, machine-specific hardware, and related technology," he says. Varley says he is "looking for machine-specific microcomputer applications," and prefers manuscripts accompanied by a disk.

Δ Four employees at **Continental Software** (Los Angeles, CA) have been promoted to new positions: **Kathryn Farmer** to vice president, administration (she had been director of administration); **Mary L. Watt** to vice president, operations (she was previously manager of accounting); **George Rodgers** to vice president, production and purchasing (from manager of production). **Jim Densmore** has been named manager of special products. He was a member of the company's customer support staff.

Δ The three-year-old **Axlon** (San Jose, CA) has relocated from Sunnyvale to a new facility in the Montague Industrial Park in San Jose. The new twenty-two-thousand-square-foot facility is a 280 percent expansion over the company's previous location. New address: 70 Daggett Drive, San Jose, CA 95131.

Δ **SKU** (Berkeley, CA), a full-service software distributor, has gone nationwide with the opening of its fourth warehouse, a fifteen-thousand-square-foot facility in Edison, New Jersey, serving the East Coast.

WELL, TO BE PERFECTLY HONEST, DIGBY, I HAVEN'T ACTUALLY DONE MUCH WORK SINCE I ACQUIRED MY NEW Mailtrak™ FROM TCI SOFTWARE... BUT LET'S KEEP THAT OUR LITTLE SECRET, SHALL WE? HMM?
...AT 2:45, TWO WEEKS FROM NEXT THURSDAY? WAIT A SECOND, I'LL CHECK MY... Agenda

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Agenda
Calendar & Expense System

With warehouses also in Chicago, Los Angeles, San Francisco, and two planned for the South, SKU will be able to supply local service to its retailers, including Computerland, in every major city nationwide.

Δ Revenues for 1982 increased 38 percent for **MSA** (Atlanta, GA), making the firm the first independent software company to surpass the $100 million milestone, according to MSA research. MSA is the largest independent supplier of computer application software. Peachtree Software is one of its subsidiaries.

Δ The formation of **Service Software** has been announced by independent distributor **Micro D** (Dallas, TX). The new company, serving a totally different type of retailer than its parent company, offers three retail services programs in a single package designed to position the mass merchandiser as a one-stop shop for home computer products. Services include rack servicing, a special-order program making it profitable to fill customer requests for nonstocked items, and a program spotlighting selected high-demand items.

Δ **Osborne/McGraw-Hill** has moved to 2600 Tenth Street, Berkeley, CA 94710. Their phone number remains the same. Former editor of *Byte* magazine, **Mark Haas**, has been named technical director of the company. He will manage the staff of technical editors and provide technical support for the division. Before joining Osborne/McGraw-Hill, Haas was an editor for the Globe Book Company and the Westinghouse Learning Corporation.

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Δ A new position has been created at **Information Unlimited Software** (Sausalito, CA). New OEM sales manager is **Kathleen Forsyth**, and she will be responsible for all OEM-related sales efforts throughout the United States and abroad. Prior to joining IUS, Forsyth was founder of Forsyth Consulting, an executive recruitment firm.

Δ The new Personal Computer magazine, *PC World* (San Francisco, CA), released its first issue on the same day the San Francisco Superior Court denied a request for a preliminary injunction against the publication. The injunction had been requested by **Ziff-Davis Publishing** (New York, NY). It contended, among other things, that the use of "PC" in the title violated the rights of Ziff-Davis, new owners and publishers of *PC* magazine. *PC World* publisher and editor David Bunnell says, "We expect to give Ziff-Davis a good run for its money." The first issue of the magazine was the largest first issue of a magazine in publishing history, according to *PC World*.

Δ Officials of **Compaq Computer** (Houston, TX) say allegations by **Texas Instruments** (Houston, TX) that Compaq misappropriated trade secrets and product designs and raided the company for key employees are totally groundless. "The Compaq computer was not conceived of, nor was design started at Texas Instruments," says Rod Canion, president of Compaq. The charges appear in the second suit filed against the company. Canion and company view the matter "merely as a nuisance suit." Canion says Compaq has furnished thousands of documents to TI attorneys relating to the charges filed and has requested that charges be specified. "To date, Texas Instruments has failed to point out a single trade secret or invention taken . . . or to substantiate any of those claims."

Δ **Lotus Development** (Cambridge, MA) has announced the resignation of **Vern Raburn** as executive vice president and general manager. President and founder Mitch Kapor says the resignation "was mutually agreed upon and resulted from differences in operating philosophy. Our differences were on a professional basis and we are pleased that the departure is an amicable one." Raburn, prior to joining Lotus, was an officer at Microsoft.

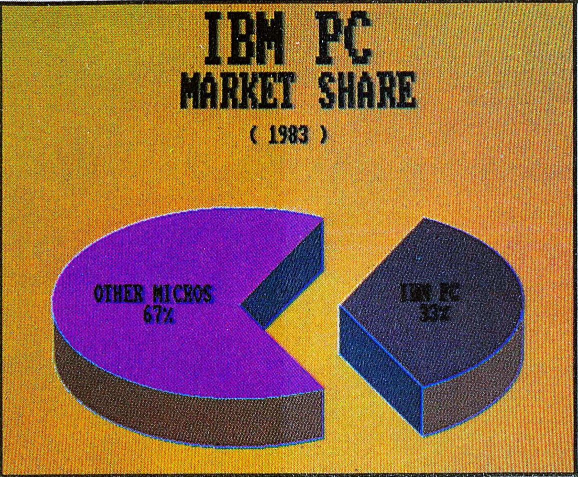
Δ The board of directors of **Bytec Management** (Ottowa, Ontario, Canada) has announced its approval of Bytec's acquisition of all remaining shares of **Dynalogic** that it does not currently own on a share-exchange basis. Bytec currently owns 80 percent of Dynalogic. "This acquisition will see Dynalogic as the operating arm of Bytec," says Glen St. John, president of Bytec. It will also allow other company subsidiaries to incorporate their manufacturing and distribution into the new acquisition. Other moves at Bytec: **Murray Bell** now assumes the position of vice president, technology, where he will coordinate engineering and product development and evaluate new high-tech opportunities for the company, and **Richard Shorkey** assumes the role of vice president of finance. **William Lipski** will become vice president and general manager of Dynalogic.

Δ International software marketer **Systems Plus** (Palo Alto, CA) has announced a multimillion-dollar agreement with **Software Dimensions** (Citrus Heights, CA) for the continued sales of all existing Software Dimensions products "in order to assure a continuation of the lowest dealer prices that can be offered on the product," according to Rick Mehrlich, president of Systems Plus.

Δ **Computerland** (Hayward, CA) has opened its four hundredth store. The celebration for the event was held in Hong Kong, where the new store, known as Computerland/USA, is located. The network of Computerlands now extends to twenty-four countries, including Europe, the Middle East, Canada, Australia, and the Far East. Company president, Ed Faber, says they are opening a new store somewhere in the world every day, and they expect to open seventy-five new international stores and between two to three hundred stateside during 1983. Computerland also announced the appointment of a new general counsel and two corporate officers to new posts. **Gary Gapp**, formerly director of accounting, was appointed vice president of financial and legal. **Deborah Dresser**, formerly corporate counsel, became vice president of administration and planning. **Mike Walter** becomes the general counsel.

Δ **Software Libraries** (Pasadena, CA) has named **Lynn Broweleit** to the new position of executive vice president and chief financial officer. Broweleit, a certified public accountant since 1979, will also hold the title of director of professional services and will work to promote software among public accounting firms.

Δ The new position of director of international marketing created at **Datamac Computer Systems** (Sunnyvale, CA) will be held by **Dr. Helmut G. Falser**. Falser has a strong international background, having spent two years in Munich, Germany, as general manager for Apple Computer's central European marketing efforts. Prior to that, he was European marketing manager for Motorola Microsystems Division, also located in Munich. ▲



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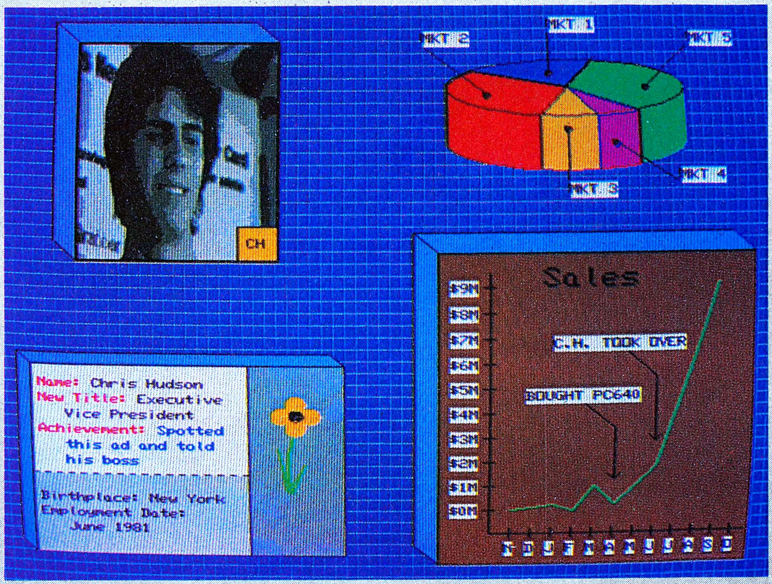
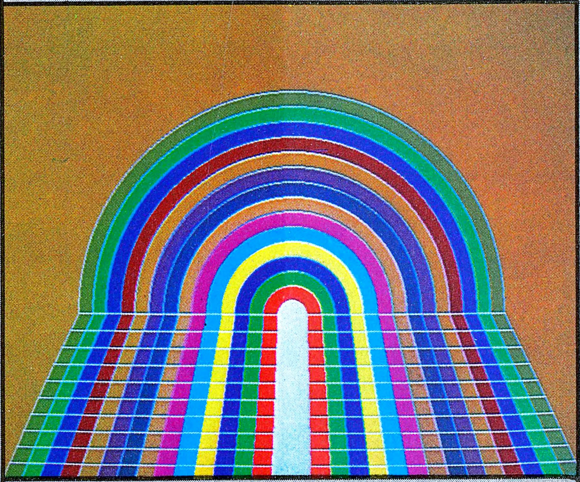


Name: Chris Hudson
New Title: Executive Vice President
Achievement: Spotted this ad and told his boss

Birthplace: New York
Employment Date: June 1981



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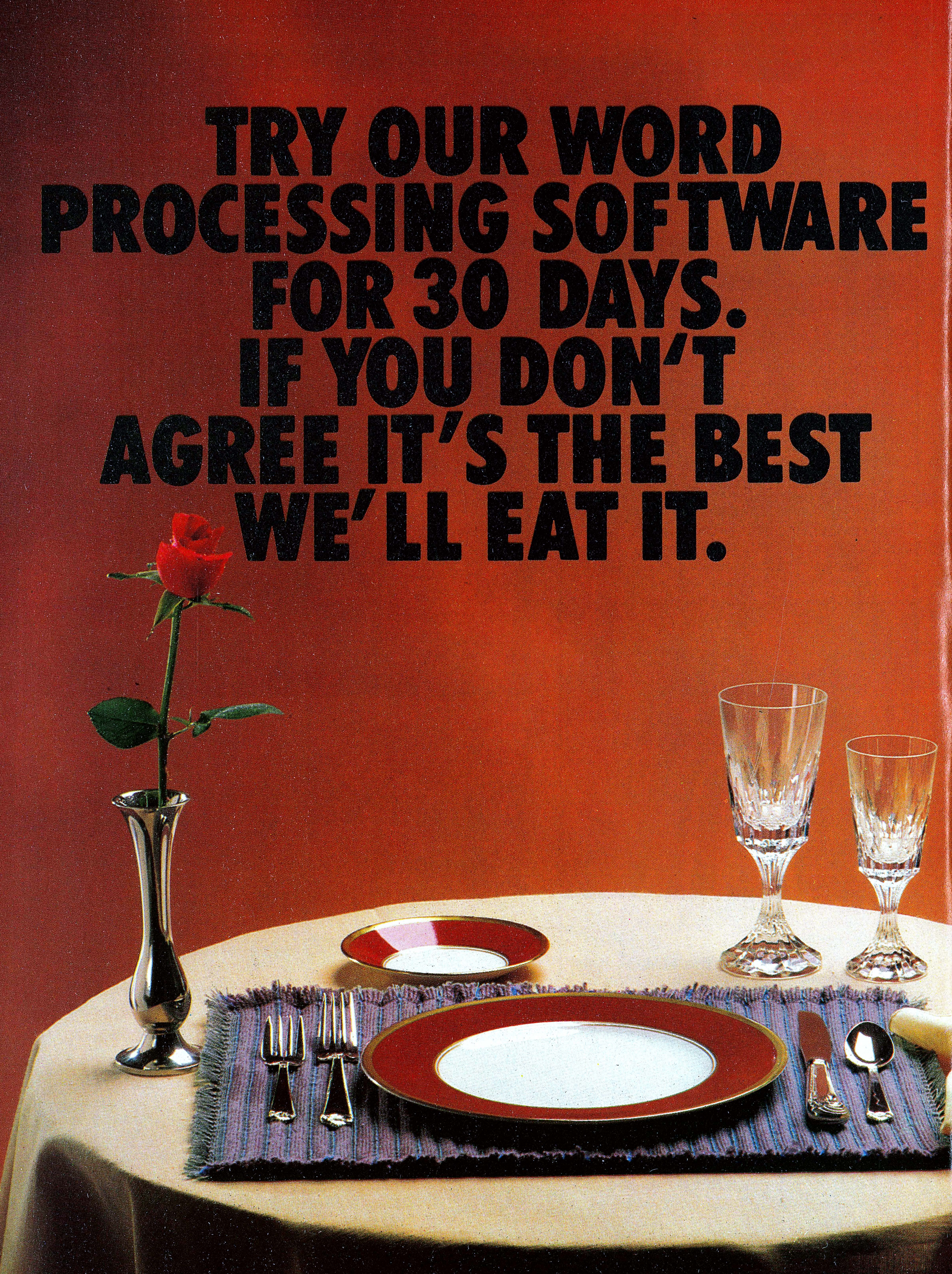
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WordPlus-PC was designed and written by Andres Escallon.

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THE PROFIT PLOT

by Jack Grushcow

Response to February's reader-interest questionnaire is gratifying, and we look forward to developing the types of spreadsheet applications that interest you. If you missed the questionnaire, let us know the topics you would like discussed in future articles by writing:

The Profit Plot
Softalk for the IBM pc
Box 60
North Hollywood, CA 91603

This is the final article in the series on retail profit control. The first article, an overview of the Retail Inventory Method (RIM), examined the five related spreadsheets that comprise this profit control system. The second article illustrated how to build and enter data into two of the RIM spreadsheets, the receiving and discount sheets.

Now we'll look at the remaining three RIM system spreadsheets. After we construct and use them, we'll consider how to apply their information.

Let's pick up where we left off last issue in the RIM system cycle. If you built the discount and receiving sheets illustrated in the March issue, you'll recall that they recorded all changes in the value of your inventory that occurred during the month.

The receiving sheet has all new additions to your stock, both at cost and at retail; the discount sheet shows the reduction in inventory that occurs when regular-price stock is marked down.

At the end of the month, this information is transferred to the next RIM system spreadsheet, the *inventory tally*.

Using the Inventory Tally. This spreadsheet provides a portrait of your inventory position. Figure 1 shows the keystrokes to build the inventory tally.

Our model shows only the first four months of the year; you can expand it, of course, to include twelve months on a single spreadsheet.

To use this sheet, you must take a physical inventory on the first month you begin using the RIM system—to establish your initial inventory value both at cost and retail. These amounts are entered opposite the label "opening inventory."

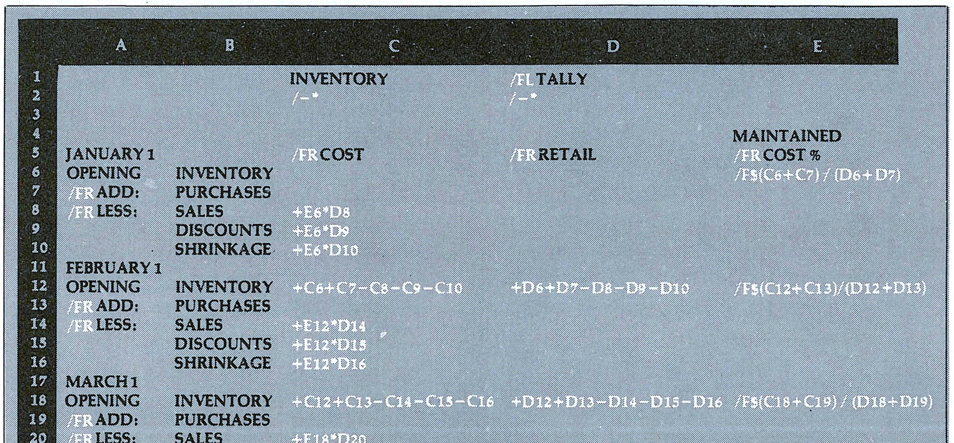
Your opening inventory at cost is recorded in cell C6 and its corresponding retail value in cell D6. The receiving sheet and discount sheet now allow you to calculate the running value of your inventory on a monthly basis. Let's see how.

Continuing our shoe store example, let's suppose Adams took a physical inventory on January 1. The inventory's retail value was $1.4 million; the value at cost was $800,000. Begin by moving your cursor to C6 and entering **800000**; at D6 enter **1400000**.

After entering the opening inventory values, you must record the additions to inventory that occurred during the month. The purchases for the month, at cost and retail, are on the receiving sheet you learned about last month. For convenience, you might refer to the March issue as we continue.

Transfer the total cost at the bottom of column D on the receiving sheet to C7 on the inventory tally. Then transfer the total retail value from the bottom of column G to D7 on the inventory tally.

We will assume that during January $20,000 worth of shoes was purchased at cost;



	A	B	C	D	E
1			INVENTORY	/FL TALLY	
2			/-*	/-*	
3					
4					MAINTAINED
5	JANUARY 1		/FR COST	/FR RETAIL	/FR COST %
6	OPENING	INVENTORY			/F$(C6+C7) / (D6+D7)
7	/FR ADD:	PURCHASES			
8	/FR LESS:	SALES	+E6*D8		
9		DISCOUNTS	+E6*D9		
10		SHRINKAGE	+E6*D10		
11	FEBRUARY 1				
12	OPENING	INVENTORY	+C6+C7−C8−C9−C10	+D6+D7−D8−D9−D10	/F$(C12+C13)/(D12+D13)
13	/FR ADD:	PURCHASES			
14	/FR LESS:	SALES	+E12*D14		
15		DISCOUNTS	+E12*D15		
16		SHRINKAGE	+E12*D16		
17	MARCH 1				
18	OPENING	INVENTORY	+C12+C13−C14−C15−C16	+D12+D13−D14−D15−D16	/F$(C18+C19) / (D18+D19)
19	/FR ADD:	PURCHASES			
20	/FR LESS:	SALES	+E18*D20		
21		DISCOUNTS	+E18*D21		
22		SHRINKAGE	+E18*D22		
23	APRIL 1				
24	OPENING	INVENTORY	+C18+C19−C20−C21−C22	+D18+D19−D20−D21−D22	/F$(C24+C25) / (D24+D25)
25	/FR ADD:	PURCHASES			
26	/FR LESS:	SALES	+E24*D26		
27		DISCOUNTS	+E24*D27		
28		SHRINKAGE	+E24*D28		

Figure 1.

Jack Grushcow is president of Consumers Software, a company that designs and markets spreadsheet-based business packages. His latest book, The VisiCalc Applications Book, *is available from Reston Publishing. This article is based on ideas contained in that book.*

the retail value of this new inventory totaled $30,000. This information is on the bottom line of January's receiving sheet. We're going to transfer it to the inventory tally by entering **20000** at C7 and **30000** at D7.

You should see 0.57 automatically displayed at E6. This is the maintained markup percentage of your inventory.

You've taken the first step toward finding the opening inventory for February. Once we subtract January's sales, shrinkage, and discounts, we'll know the inventory value at the start of February.

We have additions to inventory at cost and at retail from the receiving sheet. To find total retail sales for the month, we add up our sales slips.

Let's assume that the Shoe Barn's retail sales for January totaled $15,000. Move your cursor to D8 and enter **15000.** The equivalent cost for these sales, $8,601, appears automatically at C8.

The formula for how retail sales are converted to their approximate cost equivalent is:

Sales at cost = sales at retail * maintained cost percentage

This corresponds to the formula at C8: +E6*D8

A retail value is converted to its approximate cost equivalent by multiplying it by the cost percentage. Cost percentage is calculated from the cost and retail value of the entire inventory.

In other words, the total value of inventory at cost, divided by total inventory at retail, is a good approximation of average cost of goods. By multiplying the retail sales figure of $15,000 by the ratio of 0.57 percent, we are estimating what these sales cost us. We don't know the exact cost for each item sold during the month, but the maintained cost percentage is a very good approximation.

Next, take the total amount that inventory was reduced due to discounts, on a retail basis—shown at the bottom of column G of the discount sheet—and enter it at D9. As in the case of sales, a cost amount is automatically calculated.

Suppose the Shoe Barn's discounts for the month were $500. Move your cursor to D9 and enter **500.** The cost equivalent of $287 is displayed at C9.

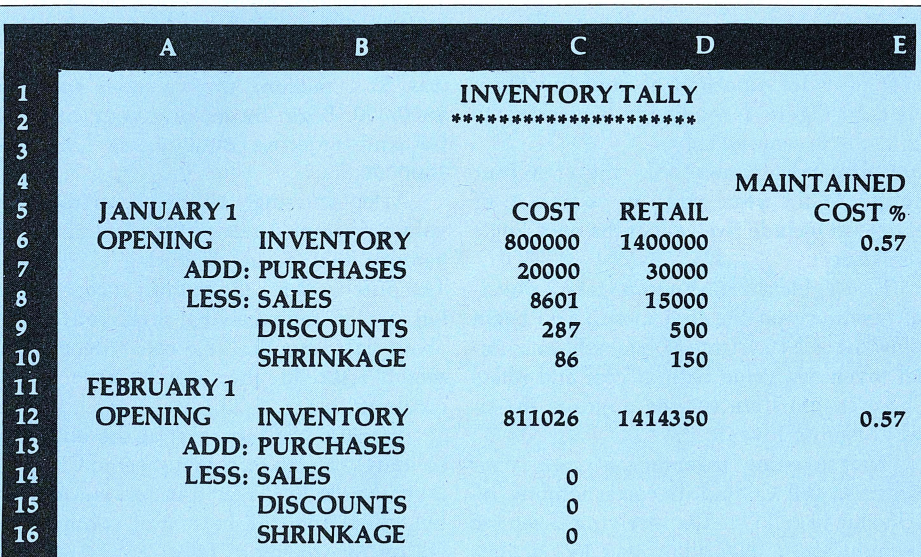
The last element we needed to complete monthly additions and reductions to January's inventory is shrinkage. Shrinkage can be determined only from a physical inventory, but most businesses can estimate shrinkage from previous experience.

Let's assume shrinkage is roughly 1 percent of monthly sales. Move your cursor to D10 and enter **150** for the shrinkage estimate. Its cost equivalent of $86 is automatically displayed in C10.

This completes the January changes in inventory. The opening figures for February are calculated automatically. In our example, February's opening inventory is valued at $1,414,350 retail and $811,026 cost.

Since the maintained markup for February depends in part on the totals from the February discount sheet and receiving sheet, we don't as yet know if there is a change in the cost percentage.

If you built the tally sheet model, compare it to figure 2.



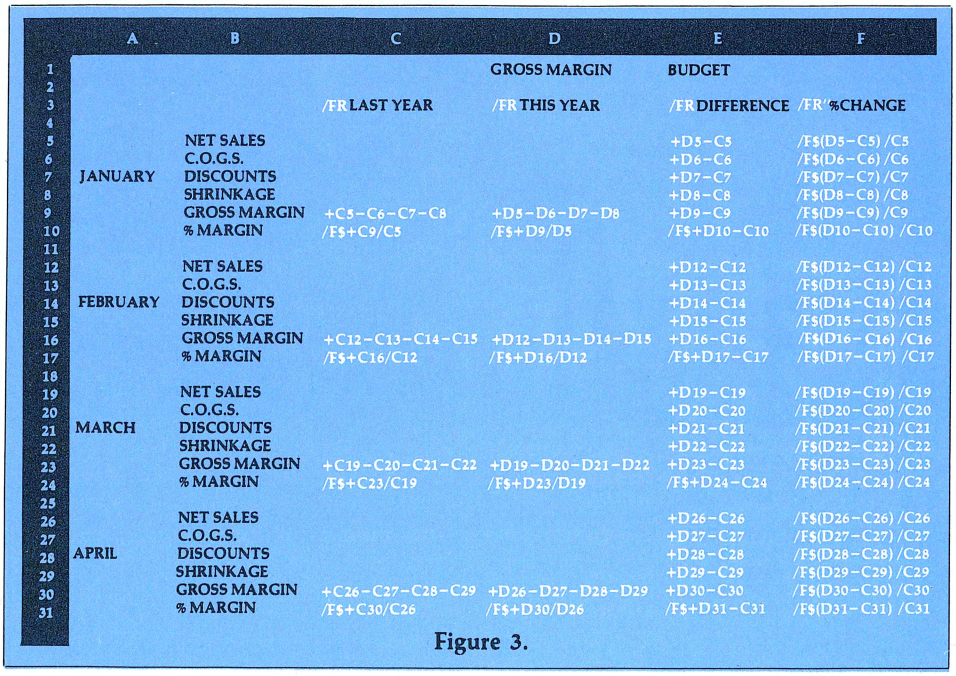
	A	B	C	D	E
1			INVENTORY TALLY		
2			**********************		
3					
4					MAINTAINED
5	JANUARY 1		COST	RETAIL	COST %
6	OPENING	INVENTORY	800000	1400000	0.57
7	ADD:	PURCHASES	20000	30000	
8	LESS:	SALES	8601	15000	
9		DISCOUNTS	287	500	
10		SHRINKAGE	86	150	
11	FEBRUARY 1				
12	OPENING	INVENTORY	811026	1414350	0.57
13	ADD:	PURCHASES			
14	LESS:	SALES	0		
15		DISCOUNTS	0		
16		SHRINKAGE	0		

Figure 2.

Keeping the inventory tally current lets you see the month-to-month changes in your inventory's value. It acts as a guardian for your profit margin. A cost percentage increase will, of course, mean a decreased profit margin.

The advantage of the inventory tally is that you don't have to wait until year's end to discover you've been making serious mistakes. The slow erosion of your profits will be obvious. We'll discuss this further when we interpret the RIM sheets.

Using the Margin Report. This report, the next spreadsheet in the RIM system, summarizes your operating results and compares them to the previous year. Figure 3 shows the keystrokes for building a margin report model; use your replicate command to simplify the exercise. Like the inventory tally, you can expand this spreadsheet to hold twelve months.



	A	B	C	D	E	F
1				GROSS MARGIN	BUDGET	
2						
3			/FR LAST YEAR	/FR THIS YEAR	/FR DIFFERENCE	/FR %CHANGE
4						
5		NET SALES			+D5−C5	/F$(D5−C5) /C5
6		C.O.G.S.			+D6−C6	/F$(D6−C6) /C6
7	JANUARY	DISCOUNTS			+D7−C7	/F$(D7−C7) /C7
8		SHRINKAGE			+D8−C8	/F$(D8−C8) /C8
9		GROSS MARGIN	+C5−C6−C7−C8	+D5−D6−D7−D8	+D9−C9	/F$(D9−C9) /C9
10		% MARGIN	/F$+C9/C5	/F$+D9/D5	/F$+D10−C10	/F$(D10−C10) /C10
11						
12		NET SALES			+D12−C12	/F$(D12−C12) /C12
13		C.O.G.S.			+D13−C13	/F$(D13−C13) /C13
14	FEBRUARY	DISCOUNTS			+D14−C14	/F$(D14−C14) /C14
15		SHRINKAGE			+D15−C15	/F$(D15−C15) /C15
16		GROSS MARGIN	+C12−C13−C14−C15	+D12−D13−D14−D15	+D16−C16	/F$(D16−C16) /C16
17		% MARGIN	/F$+C16/C12	/F$+D16/D12	/F$+D17−C17	/F$(D17−C17) /C17
18						
19		NET SALES			+D19−C19	/F$(D19−C19) /C19
20		C.O.G.S.			+D20−C20	/F$(D20−C20) /C20
21	MARCH	DISCOUNTS			+D21−C21	/F$(D21−C21) /C21
22		SHRINKAGE			+D22−C22	/F$(D22−C22) /C22
23		GROSS MARGIN	+C19−C20−C21−C22	+D19−D20−D21−D22	+D23−C23	/F$(D23−C23) /C23
24		% MARGIN	/F$+C23/C19	/F$+D23/D19	/F$+D24−C24	/F$(D24−C24) /C24
25						
26		NET SALES			+D26−C26	/F$(D26−C26) /C26
27		C.O.G.S.			+D27−C27	/F$(D27−C27) /C27
28	APRIL	DISCOUNTS			+D28−C28	/F$(D28−C28) /C28
29		SHRINKAGE			+D29−C29	/F$(D29−C29) /C29
30		GROSS MARGIN	+C26−C27−C28−C29	+D26−D27−D28−D29	+D30−C30	/F$(D30−C30) /C30
31		% MARGIN	/F$+C30/C26	/F$+D30/D26	/F$+D31−C31	/F$(D31−C31) /C31

Figure 3.

To use this sheet, you plug in the month's sales, cost of goods sold, discounts, and shrinkage. The gross margin and percent margin are calculated for you. You can also see the difference in results between this year and last.

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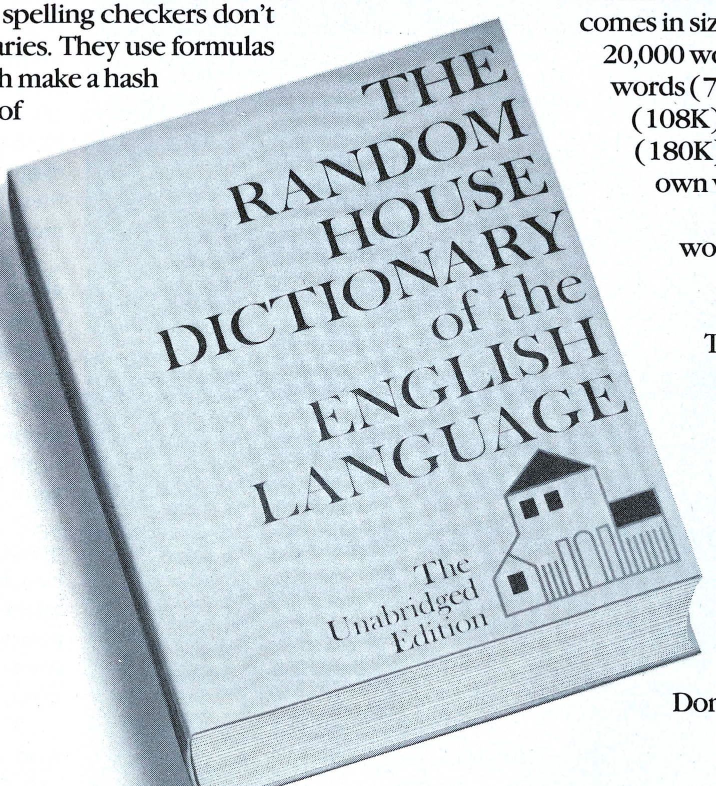

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	Last Year	This Year	Inventory Tally Location
Sales	11,000	15,000	D8
Cost of goods	6,200	8,601	C8
Discounts	800	500	D9
Shrinkage	120	150	D10

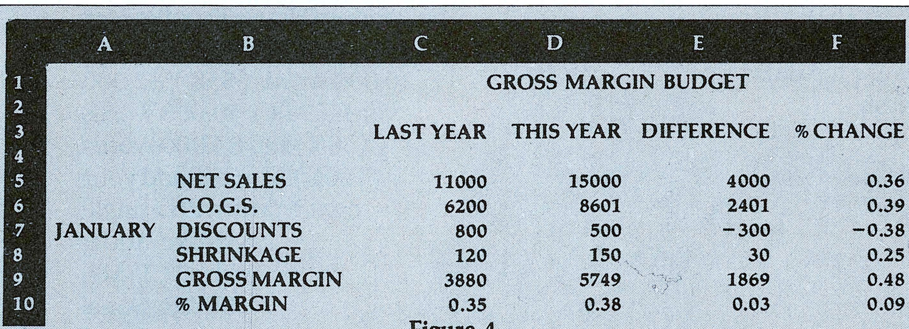
Table 1

Cell	Figure
C5	11000
C6	6200
C7	800
C8	120
D5	15000
D6	8601
D7	500
D8	150

Table 2

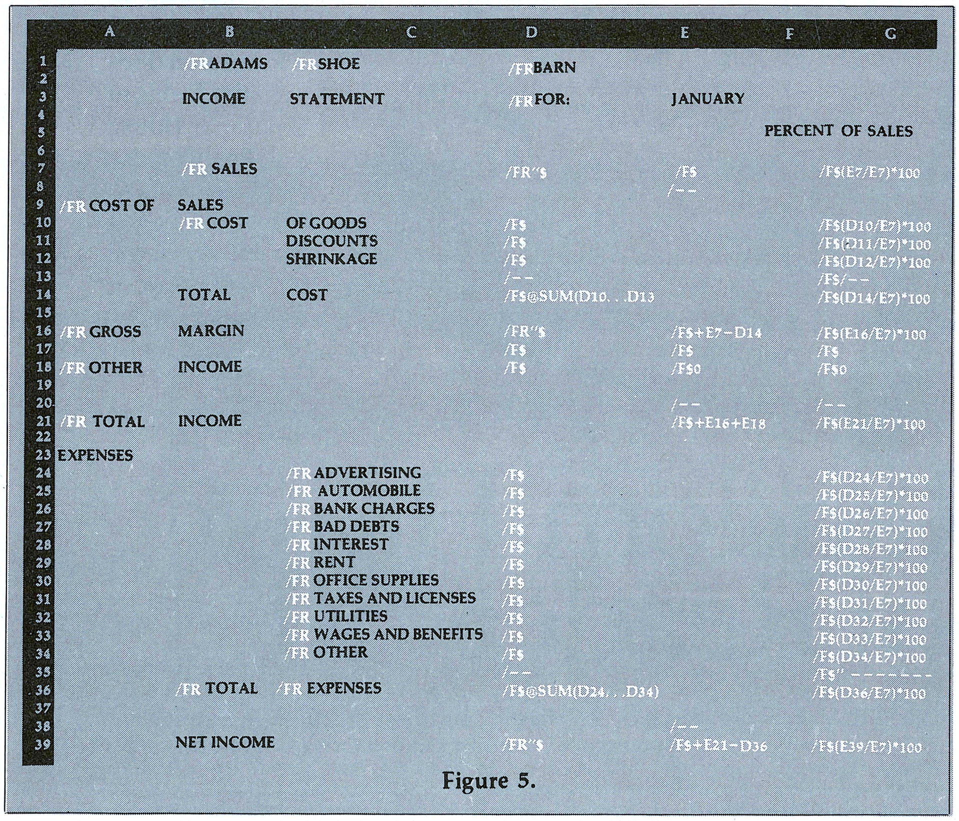
Inventory tally spreadsheet location		Figure	Income statement cell
Sales	D8	15000	E7
Cost of goods	C8	8601	D10
Discounts	C9	287	D11
Shrinkage	C10	86	D12

Table 3



	A	B	C	D	E	F
1			GROSS MARGIN BUDGET			
2						
3			LAST YEAR	THIS YEAR	DIFFERENCE	% CHANGE
4						
5		NET SALES	11000	15000	4000	0.36
6		C.O.G.S.	6200	8601	2401	0.39
7	JANUARY	DISCOUNTS	800	500	−300	−0.38
8		SHRINKAGE	120	150	30	0.25
9		GROSS MARGIN	3880	5749	1869	0.48
10		% MARGIN	0.35	0.38	0.03	0.09

Figure 4.



	A	B	C	D	E	F	G
1		/FRADAMS	/FRSHOE	/FRBARN			
2							
3		INCOME	STATEMENT	/FRFOR:	JANUARY		
4							
5						PERCENT OF SALES	
6							
7		/FR SALES		/FR"$	/F$		/F$(E7/E7)*100
8					/--		
9	/FR COST OF	SALES					
10		/FR COST	OF GOODS	/F$			/F$(D10/E7)*100
11			DISCOUNTS	/F$			/F$(D11/E7)*100
12			SHRINKAGE	/F$			/F$(D12/E7)*100
13				/--			/F$/--
14		TOTAL	COST	/F$@SUM(D10. . .D13			/F$(D14/E7)*100
15							
16	/FR GROSS	MARGIN		/FR"$	/F$+E7−D14		/F$(E16/E7)*100
17				/F$	/F$		/F$
18	/FR OTHER	INCOME		/F$	/F$0		/F$0
19							
20					/--		/--
21	/FR TOTAL	INCOME			/F$+E16+E18		/F$(E21/E7)*100
22							
23	EXPENSES						
24			/FR ADVERTISING	/F$			/F$(D24/E7)*100
25			/FR AUTOMOBILE	/F$			/F$(D25/E7)*100
26			/FR BANK CHARGES	/F$			/F$(D26/E7)*100
27			/FR BAD DEBTS	/F$			/F$(D27/E7)*100
28			/FR INTEREST	/F$			/F$(D28/E7)*100
29			/FR RENT	/F$			/F$(D29/E7)*100
30			/FR OFFICE SUPPLIES	/F$			/F$(D30/E7)*100
31			/FR TAXES AND LICENSES	/F$			/F$(D31/E7)*100
32			/FR UTILITIES	/F$			/F$(D32/E7)*100
33			/FR WAGES AND BENEFITS	/F$			/F$(D33/E7)*100
34			/FR OTHER	/F$			/F$(D34/E7)*100
35				/--			/F$" --------
36		/FR TOTAL	/FR EXPENSES	/F$@SUM(D24. . .D34)			/F$(D36/E7)*100
37							
38					/--		
39		NET INCOME		/FR"$	/F$+E21−D36		/F$(E39/E7)*100

Figure 5.

Table 1 shows the January results for the Shoe Barn. Last year's figures were taken from historic reports; current data comes from the inventory tally, as indicated.

Enter the information in table 2 into our spreadsheet model, and then compare the model to figure 4. You will see that the gross margin is $1,869 greater than the previous year, an increase of 48 percent. Margin as a percentage of sales increased 9 percent, an improvement accomplished possibly by better buying, with less need to discount goods, or possibly by lower costs from quantity purchases.

Interpreting the RIM Spreadsheets. We've learned how to build the spreadsheets and enter data into them. That's important, of course, but the real benefits are in learning how to interpret and apply the information they reveal.

The power of these models is in showing you the daily pulse of your retail business. You need to know who your best suppliers are, the products that sell well and those that require discounting. You need to know whether your profit margin is increasing or decreasing.

And you need to know this information in time to take corrective action. A detailed diagnosis is no good to a dead patient. Keep these spreadsheets up-to-date and you can monitor the *current* health of your business.

Let's review the key points to remember about the spreadsheets we've discussed.

1. *Receiving sheet.* This detailed record of all new stock purchases is your box score. Review these sheets to see which suppliers offer the best margins and which shave things a bit close. This sheet reveals which suppliers are keeping you in business. Know your friends.

2. *Discount sheet.* This sheet complements the receiving sheet, because it reveals how honest a supplier is about the price and salability of his products. Products that appear to offer a good margin can have hidden costs if you have to discount them to sell them.

3. *Inventory tally.* This sheet monitors your inventory. The alarm will sound here first if your margin starts to decline. An increase in the maintained cost percentage indicates that your cost of goods is rising. Then look at the receiving and discount sheets for declining margins and increasing discounts to find out which suppliers are responsible for lost revenues.

4. *Margin report.* The historic perspective will help you recognize when problems start to develop. By analyzing margin fluctuations on a monthly basis, you can spot seasonal tendencies that can help you plan your buying strategy and improve your cash-flow forecasting.

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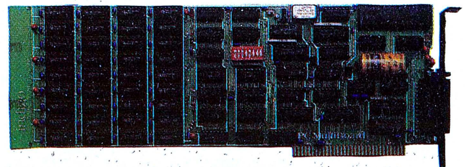

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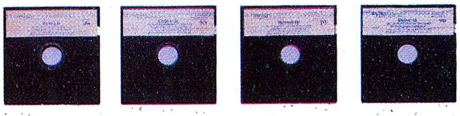

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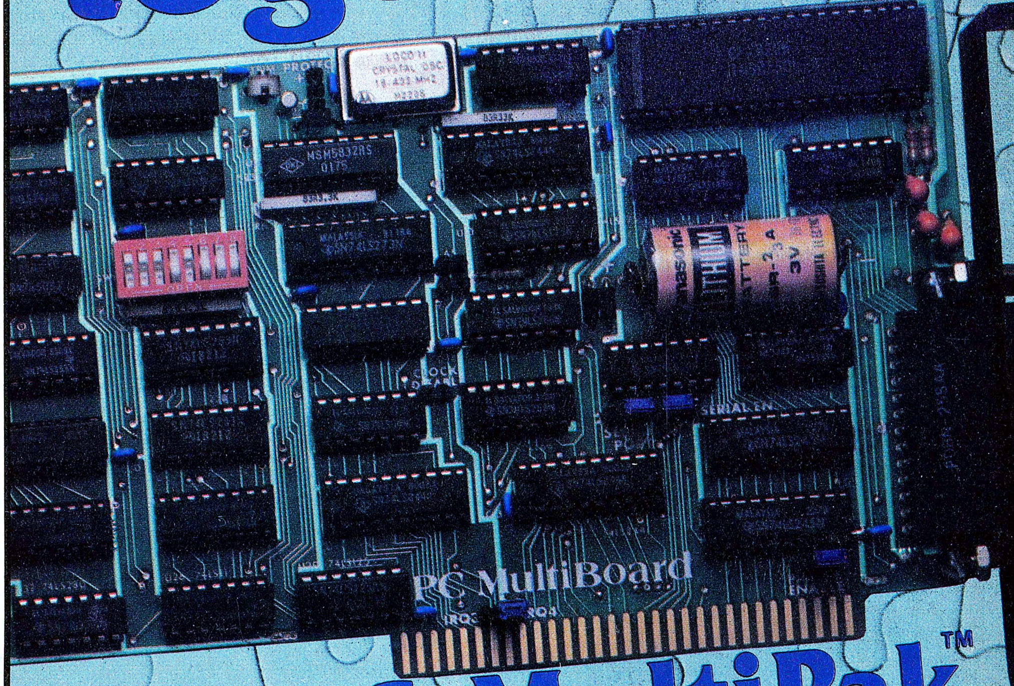

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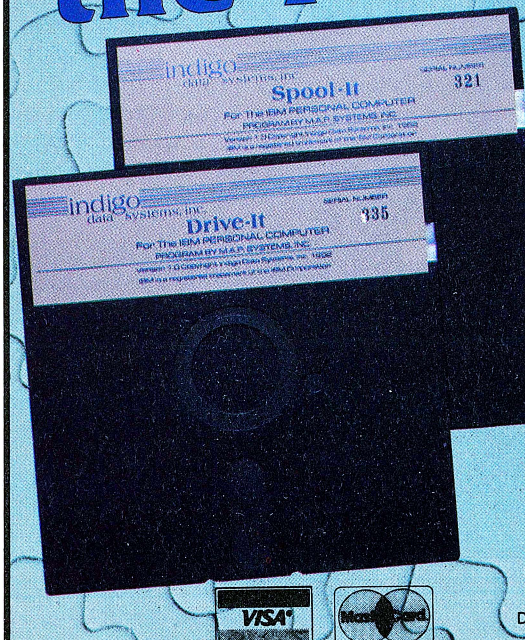
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To build the model, insert the information shown in table 3. Figure 6 shows the completed January income statement for Adams Shoe Barn.

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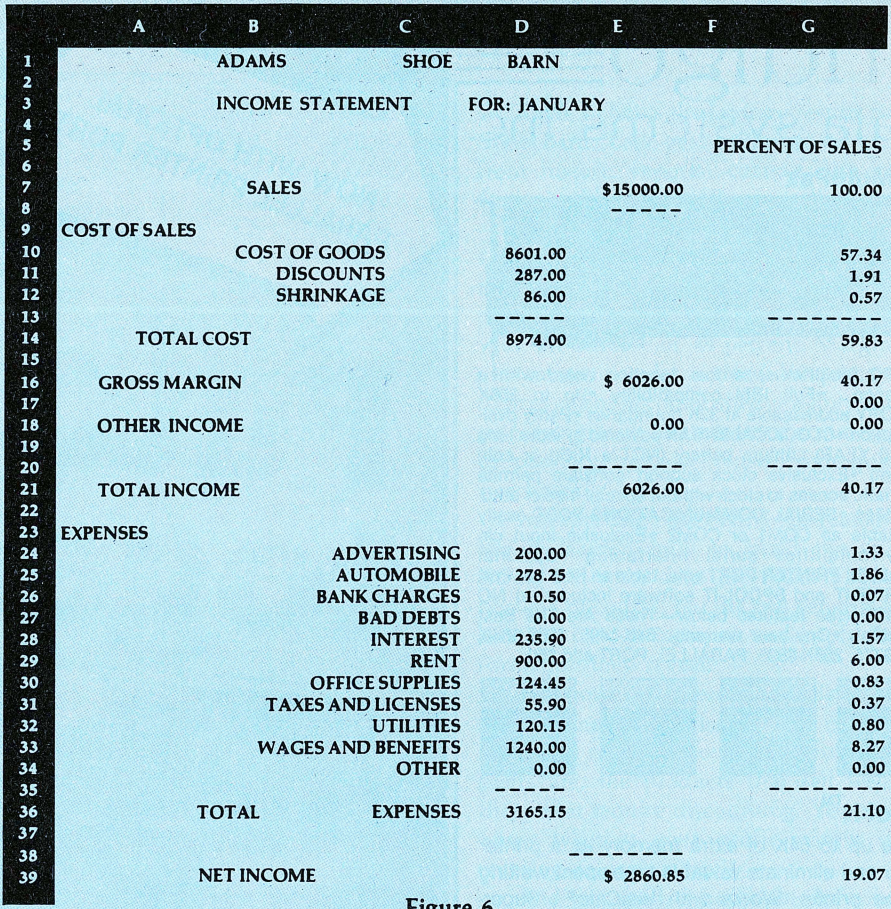

```
        A           B                 C            D           E              F       G
 1                  ADAMS             SHOE         BARN
 2
 3                  INCOME STATEMENT               FOR: JANUARY
 4
 5                                                                       PERCENT OF SALES
 6
 7                     SALES                                  $15000.00            100.00
 8                                                            -----
 9 COST OF SALES
10                        COST OF GOODS           8601.00                           57.34
11                            DISCOUNTS            287.00                            1.91
12                            SHRINKAGE             86.00                            0.57
13                                                -----                          --------
14             TOTAL COST                         8974.00                           59.83
15
16          GROSS MARGIN                                      $ 6026.00             40.17
17                                                                                   0.00
18          OTHER INCOME                                           0.00              0.00
19
20                                                            --------           --------
21          TOTAL INCOME                                        6026.00             40.17
22
23 EXPENSES
24                                   ADVERTISING   200.00                            1.33
25                                    AUTOMOBILE   278.25                            1.86
26                                 BANK CHARGES     10.50                            0.07
27                                     BAD DEBTS     0.00                            0.00
28                                      INTEREST   235.90                            1.57
29                                          RENT   900.00                            6.00
30                               OFFICE SUPPLIES   124.45                            0.83
31                          TAXES AND LICENSES      55.90                            0.37
32                                     UTILITIES   120.15                            0.80
33                        WAGES AND BENEFITS      1240.00                            8.27
34                                         OTHER     0.00                            0.00
35                                                -----                          --------
36               TOTAL               EXPENSES     3165.15                           21.10
37
38                                                            --------
39               NET INCOME                                   $ 2860.85             19.07
```

Figure 6.

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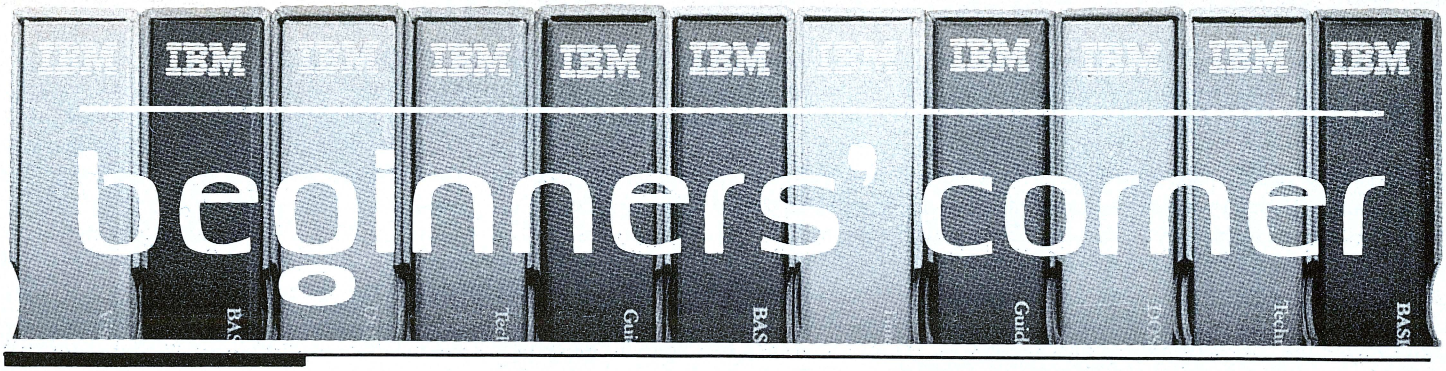

beginners' corner

by Craig Stinson

If you're like most pc users, you probably do at least a little word processing on your computer. And having gotten the hang of your word processing program, you've probably come to think of the pc keyboard as an extension of your fingers; you strike a key and immediately the appropriate letter appears before your eyes—just as it did in olden days on that Underwood or Smith-Corona you used to know and love.

But, of course, your pc keyboard is not a mechanical device like your old typewriter. So what does happen when you type a character at your computer keyboard? Clearly, something travels down that coiled wire, but what is that something and how does it get to be a character on your screen? Or how and why does it *not* come to be a character on your screen?

You might be surprised to know how much goes on inside your pc each time you tap its keyboard. If you happen to have a copy of IBM's *Technical Reference* manual handy, turn to page 23 of Appendix A; there you'll find eight pages of four-point type listing the assembly language instructions that do the initial processing of each keystroke. And those eight pages of fine print are only a way station on a keystroke's journey to the screen (or wherever else it may be headed).

What follows here is a grossly simplified (although interesting, we hope, and possibly even illuminating) description of the events that occur.

From Key to Screen. Each of the eighty-three keys on your keyboard is capable of producing a unique electronic signal, called a *scan code*. When you press a key, its scan code courses through the black umbilicus to the system unit, where it becomes fodder for a routine within the ROM BIOS program.

BIOS stands for *B*asic *I*nput *O*utput *S*ystem. The ROM BIOS is a set of instructions stored permanently in read-only memory. It controls fundamental operation of the computer. One subset of these instructions is devoted to the reception, temporary storage, and interpretation of keyboard input.

In the commonest course of events, when you hit a key, the number that represents the scan code is converted to another number by means of a different code, called ASCII. The ASCII value for whatever key you have pressed then gets stored in one of the registers within the pc's microprocessor (specifically, the lower half of the AX register) and there becomes available to whatever program you're running at the time.

Say, for example, you're working in *WordStar*. *WordStar* snatches the ASCII number for your keypress from the AL register and passes it to another subset of the ROM BIOS, which carries out some other processing steps that result in the appropriate character's appearance in the appropriate location on the appropriate video display. All this happens quickly enough to give you the feeling that you're working at a mechanical keyboard (happens, as they say, in *real* time). This should give you some appreciation for the time scale on which events occur in your computer.

If you throw characters at your application program faster than it can process them, the keyboard input routine in the ROM BIOS stores the overflow for you in an area of memory called a buffer (*buffer* is a general term for a temporary storage area; usually it refers to an area of random-access memory, although it's possible also for a portion of a disk to be used as a buffer). The ROM BIOS buffer has room for fifteen characters. When the fifteen slots are full, additional keypresses will only evoke a squeal from the pc speaker.

Some application programs—*WordStar* and *VisiCalc* are among them—provide their own buffering services. If you give *VisiCalc* a time-consuming calculation to perform, you can punch in about thirty keystrokes while it's busy. The program is smart enough to interrupt its arithmetic activities periodically and keep an eye on the keyboard. It will also empty its own buffer if you type control-C while it's working.

The Hotline. Some characters you type are screened out by the BIOS input routine and treated specially, rather than being passed through normal channels to the microprocessor or the keyboard buffer. Shift-printscreen and control-numlock are examples.

If you hold down either shift key and hit printscreen, it doesn't matter what else is going on. Whether your pc is reading data from disk, writing a file to disk, crunching numbers, or simply standing by, as soon as that particular character arrives, the ROM BIOS kicks into its screen dump routine, sending whatever is on your display to the printer.

Similarly, if you hold down control and hit the numlock key, the computer stops whatever it's doing and waits for you to press another key. Like shift-printscreen, control-numlock is effective immediately. It doesn't matter what else is going on. In fact, the suspend feature takes precedence over the screen dump feature. You can interrupt a screen dump by typing control-numlock. Of course the printing resumes as soon as you hit another key. The converse is not true. If you hit shift-printscreen after hitting control-numlock, you only take the computer out of suspense; in fact that's one of the few situations in which you can hit shift-printscreen without invoking the dump.

There's one other keystroke that gets immediate attention from your computer; that's control-alt-delete, which aborts whatever else is going on and puts the machine in a reset cycle. The reset cycle does about the same thing that turning off the computer and turning it back on does, except that you don't have to wait through the power-on self test.

Speaking of the power-on self test, that's one of the only times when the printscreen, suspend, and reset operations are ineffective. Hitting shift-printscreen during the power-on test usually brings down an error code 301 from the POST routine—which just means that it found keyboard input when, by its reasoning, there shouldn't have been any. Another situation when these functions may not work is when your computer gets into a certain kind of abnormal loop. It doesn't happen often, but either a hardware mishap or faulty programming can put your computer into a condition where it won't respond to any input—not even to control-alt-delete. If that happens, there's no remedy but to shut it off and start over. If your machine should get stuck in this fashion while engaged in disk activity, it may go to lunch with the motor running. If that happens, it's fairly important to shut the computer off; the disk motors were not designed for continuous duty.

There's a reason why, when conditions are normal, the screen dump, suspend, and reset functions get priority treatment. IBM wanted to make these functions available to you at all times, regardless of what program you might be running. By checking for these three keystrokes before sending input values to your application program, IBM made certain that application programs wouldn't mask or alter these amenities.

They probably could have done better in two respects. It would have been nice to have a reset button that went straight to the microprocessor without having to be handled by any BIOS routines at all. That way you could reset the computer under any circumstances and pull out of a disaster loop without having to erase the contents of RAM. To their credit, though, IBM did make the reset key combination awkward so you wouldn't reset unintentionally.

Would that they had done the same with printscreen. The fact that the printscreen key sits next to the right shift key means that a simple *fingerfehler* can send you to the printer whether you feel like going or not—and whether you have a printer or not.

Those Are the Breaks. Once your keystrokes have passed the ROM BIOS input routines, they are normally handled in order by whatever program you're running. But not always.

Both DOS and the Basic Interpreter, for example, scan input to see if you've typed control-break (control-scroll-lock). If they detect that character they abandon ship immediately, even if there's a bufferful of other characters in line.

The following experiment proves the point. Put a disk in drive A that has a lot of files on it. Enter the directory command, *dir*, and while the directory is scrolling by, type a bunch of keystrokes. You can just hold down one key if you like and let the *typematic* feature enter repeated keystrokes into the system. When you get fifteen strokes in there, you'll start getting beeps. Now, before the directory is played out, type control-break. DOS immediately aborts the listing, showing that it "sees" the break request even when normal input channels are full.

Notice that DOS prints a ∧ C on your screen before returning control to you. That's because control-C is widely used as a break signal for computers of all stripes. Why IBM (Microsoft?) chose to use a procedure other than control-C is not clear, but the display of ∧ C on your screen, in response to control-break, is a little bow of acknowledgement to the rest of the computer world.

Just to give your curiosity a little more workout, try issuing a *dir* and then typing control-C; don't hit any other characters before the control-C. Notice that control-C acts like control-break and terminates the execution of your DOS command. But now try doing the *dir*, then typing a few characters while the directory list is in progress, then typing control-C. No good. The directory plays out before DOS recognizes a halt signal. Evidently control-C has to get in line, just like any other character; if the buffer is full when you type control-C, DOS won't see it at all.

None of this information is particularly vital, but it's good to poke around with your computer and try to get a feel for what it does when. Unless you're playing around with the *erase* command (or Basic's equivalent, *kill*), you can't do any damage, because you're only moving bits around in memory. The only thing to avoid, aside from erasing or overwriting disk files, is interfering with the mechanical actions of your disk drive. Don't open the drive door while it's writing data. If you're not sure when it's writing, just leave the door closed whenever the red light is on.

Next month we'll look a little closer at scan codes and ASCII codes. ▲

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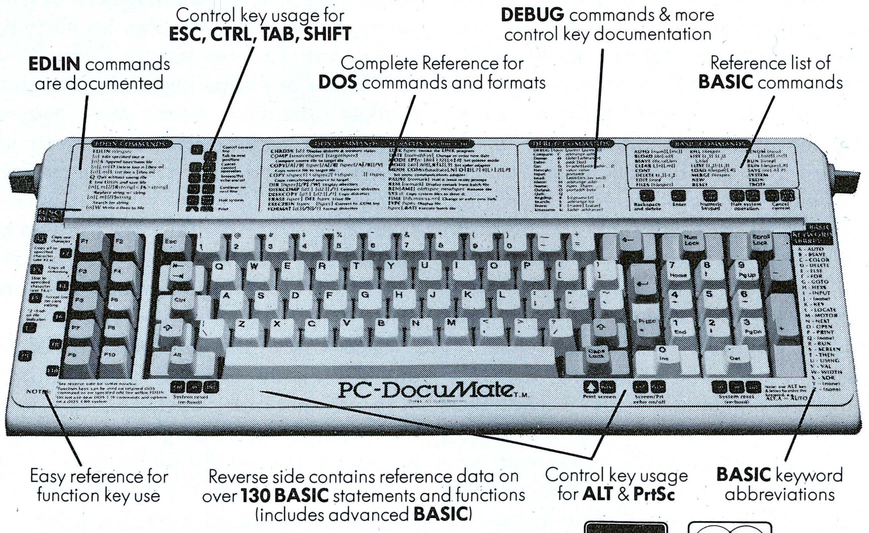
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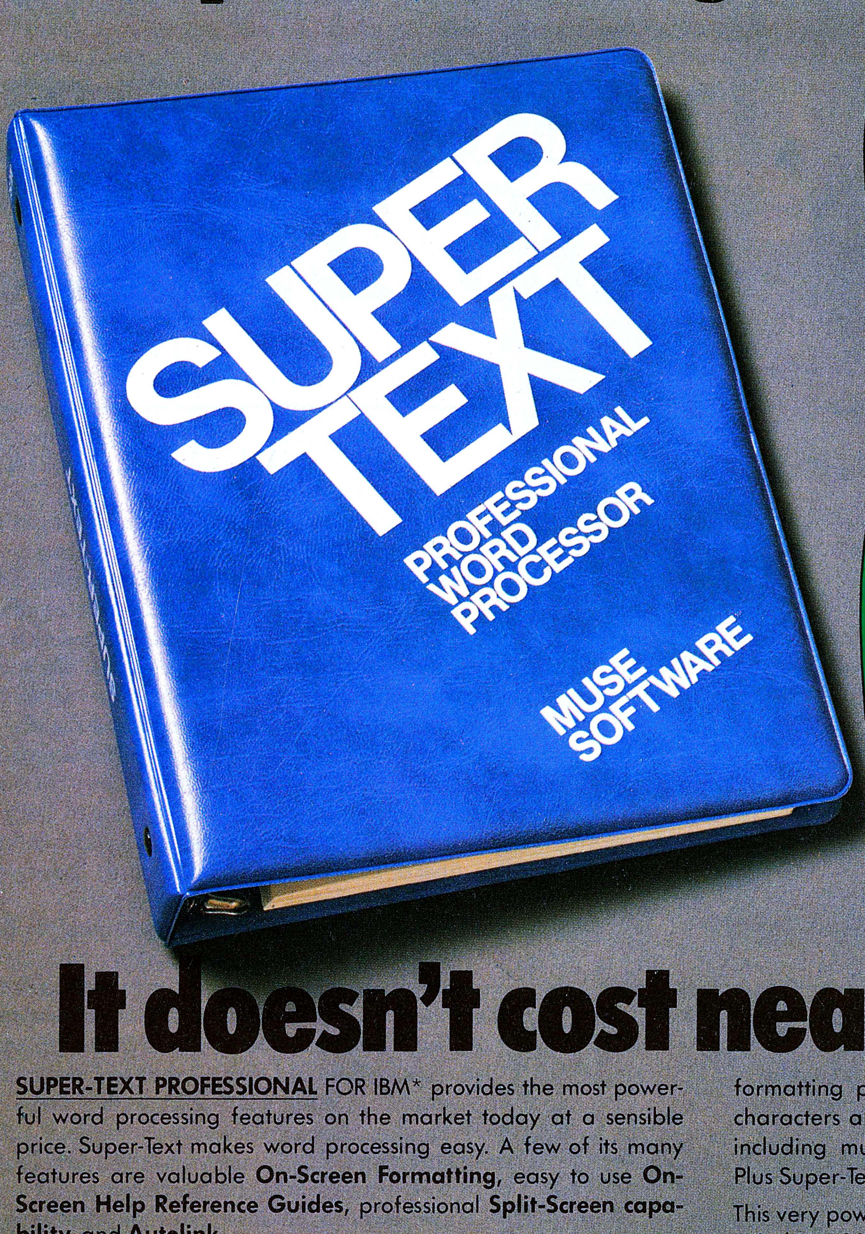
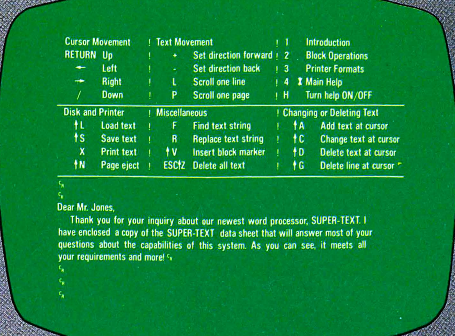
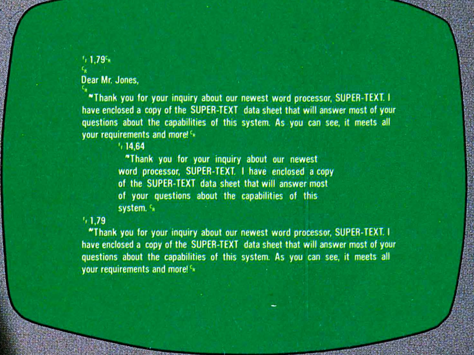




```
Cursor Movement     ! Text Movement                 ! 1     Introduction
RETURN  Up          !     +     Set direction forward ! 2   Block Operations
   ←    Left        !     -     Set direction back    ! 3   Printer Formats
   →    Right       !     L     Scroll one line       ! 4 ↕ Main Help
   /    Down        !     P     Scroll one page       ! H   Turn help ON/OFF
--------------------------------------------------------------------------
Disk and Printer    ! Miscellaneous                 ! Changing or Deleting Text
  ↑L    Load text   !     F     Find text string    !   ↑A    Add text at cursor
  ↑S    Save text   !     R     Replace text string !   ↑C    Change text at cursor
   X    Print text  !    ↑V     Insert block marker !   ↑D    Delete text at cursor
  ↑N    Page eject  !  ESC↑Z    Delete all text     !   ↑G    Delete line at cursor
--------------------------------------------------------------------------
CR
CR
Dear Mr. Jones,
   Thank you for your inquiry about our newest word processor, SUPER-TEXT. I
have enclosed  a copy of the SUPER-TEXT  data sheet that will answer most of your
questions about the capabilities of this system. As you can see, it meets all
your requirements and more! CR
CR
CR
CR
```

ON-LINE "HELP"



```
f 1,79CR
CR
Dear Mr. Jones,
CR
  "Thank you for your inquiry about our newest word processor, SUPER-TEXT. I
have enclosed a copy of the SUPER-TEXT  data sheet that will answer most of your
questions about the capabilities of this system. As you can see, it meets all
your requirements and more! CR
           f 14,64
             "Thank  you  for  your  inquiry  about  our  newest
           word  processor,  SUPER-TEXT.  I  have  enclosed  a copy
           of  the  SUPER-TEXT  data sheet  that will  answer most
           of  your  questions  about  the  capabilities  of  this
           system. CR
f 1,79
  "Thank you for your inquiry about our newest word processor, SUPER-TEXT. I
have enclosed a  copy of the SUPER-TEXT  data sheet that will answer most of your
questions about the capabilities of this system. As you can see, it meets all
your requirements and more! CR
```

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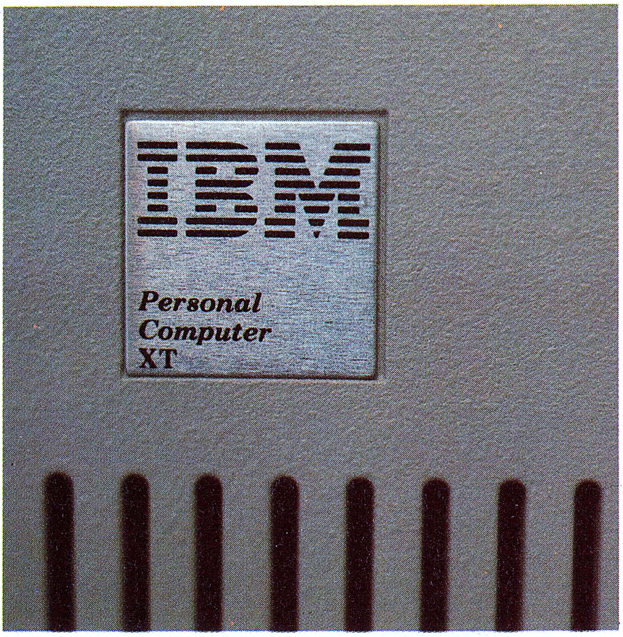

A SYSTEM NOTEBOOK FEATURE

INTRODUCING DOS 2.0...

by Alan Boyd

The difference between DOS 2.0 and 1.1 is significantly greater than 1.1 and 1.0. In fact, probably no system software has changed as dramatically as DOS has in just over a year.

Many DOS 2.0 enhancements are designed to work with IBM's new hard disk, or fixed disk, as they call it.

A quick look at the sixteen-bit computer market suggests why DOS has changed. In August 1981, the pc was, effectively, the first major introduction of a sixteen-bit personal computer system. And, consequently, there was little software for it. Most of the early software available for the pc, both from IBM and independent vendors, was translated feature for feature from existing eight-bit programs.

Over time, the computer was set to increasingly demanding tasks, with new, more powerful, concepts introduced. And as software matured, the computer overcame barriers once considered impassable. The same progression occurred earlier on the Apple II; programs are available today for that machine that were considered impossible three years ago.

New generations of software at first often simply emulate the performance and features of earlier incarnations. The earliest DOS version was not radically different from the even earlier eight-bit CP/M-80 operating system. Admittedly, DOS did overcome many CP/M limitations, such as the disturbing inability of that system to recover after errors. But a consideration of CP/M was obvious in the design philosophy of DOS.

DOS 2.0, however, goes far beyond any eight-bit system; in fact, few features of that generation of operating systems remain. DOS 2.0 is more akin to minicomputer operating systems, with the major exception that minicomputers and their operating systems generally are designed for multiuse service.

Microsoft is the vendor for DOS and for the Xenix multiuser operating system. Consequently, it's probable that DOS will eventually resemble a single-user version of Xenix and become somewhat compatible with Bell Lab's Unix (Xenix is a superset of Unix). Many DOS 2.0 features point in that direction.

We're going to look at the new commands in DOS, but first we'll summarize the major features.

Tree-Structured Directories. DOS 2.0's most obvious feature is its hierarchical directory structure, designed to facilitate the pc's use with a hard disk. IBM's introduction of its own hard disk system obviously requires that DOS accommodate it.

As you know, the number of files that can be stored on a disk is finite, determined by and designed for available disk space, which is proportional to the storage space allocated to the directory.

A floppy-disk-based system works conveniently with a single directory, since the number of files is limited to 64 for single-sided disks and 112 for dual-sided. Dramatically, when a hard disk is attached, the pc can store several thousand files, if you extrapolate according to available storage space.

Storing that many files in a single directory, as DOS 1.0 and 1.1 do, presents two problems. First, a *dir* command, even one containing wild cards to reduce the number of files displayed, would mean several minutes of watching file names scroll off your screen. Second, consider the access time for DOS to read or write to or from a file. Each time it accesses a disk, DOS searches the directory. This is an acceptable access method when working with limited-storage floppy disks, but it would be tediously slow with a hard disk containing several thousand names and disk addresses.

The solution is DOS 2.0's multiple directories that users can customize to their needs. These directories are hierarchical; the bottom directory of this system is the "root" directory. It looks like the simple single directory of DOS 1.1, but each directory entry can be a DOS file *or* the name of another directory—more accurately, a subdirectory. Branching from the root directory can be several directories, each of which can contain files or other subdirectories. This tree-structure system allows the user to organize and allocate file space by function.

On a floppy disk, the root directory, like the standard single directory of earlier DOS versions, can hold either 64 or 112 entries, depending on disk drives. On a hard disk, the number of entries in the root directory depends on how disk space is allocated. We'll examine this somewhat complex mechanism in a future article.

Several utility commands permit users to move between directories and up and down the tree structure. The link between two connected directories is called a *path*, and users move up and down the tree by specifying a *pathname*. Other commands create and delete directories. Essentially, this system is like having several disks in the drive at once.

Obviously, this affects the *filespec* we all know and love. You can now have two or more files with the same name on the same disk (but not in the same directory). Only the path from the root to the appropriate directory discriminates between them. Now the filespec for a particular file must include drive designation, file name, *and* the path DOS must take through the tree to find the file.

DOS 1.0 introduced the concept of a default drive (also called the working or current drive), the drive accessed if you don't specify one. DOS 2.0 has the analogous concept of a default directory, also called the working or current directory.

Background Printing. Perhaps the handiest of DOS's new features is its ability to queue documents for printing in background mode. That is, while the printer is printing, the computer can be put to other use. This is particularly impressive with a highly interactive program: the pc will send characters to the printer between keystrokes.

Although this feature represents a significant advance, DOS is still not a full multitasking operating system; concurrent capabilities don't make much sense for the pc, given available software. However, the spooling feature can be extended to any specially configured task, which means that one day other background tasking capabilities may be built into DOS—such as background communications or electronic mail.

A new external DOS command, *print,* can queue up to ten named disk files for printing. Since DOS 2.0 has better I/O redirection capabilities, the implications of this background printing capability can easily be extended to other tasks. We may see applications programs soon take advantage of this feature in situations, such as networking, where multiple pcs might share a device.

Hard Disk Support. DOS 2.0 officially permits one or more hard disk drives. Each hard disk can be partitioned into separate areas to work with other operating systems, such as CP/M-86 or the p-System.

Volume Names. DOS 2.0 identifies a disk by name, assigned when the disk is formatted and displayed when the disk directory is listed. This helps users know they are writing information to the proper disk. Applications programs will use this volume name as a safety feature to ensure that the proper disk is in the disk drive.

Installable Device Drivers. A feature that may not seem wonderful to you now is DOS's new ability to configure and install device drivers at boot time. Many users will find this somewhat confusing, since the term *device driver* is new to DOS. A device driver is a software routine that controls a specific peripheral, such as a printer or hard disk, attached to the computer. It is logically placed between the operating system and the device and allows applications programs to operate the device.

Many new peripherals will either have to emulate an IBM-supplied device and use the system's built-in device drivers, or include a separate device driver. This feature, although technical sounding, will aid novices in configuring and reconfiguring their systems.

Previously, installation of device drivers was left to hardware manufacturers, who typically included a patch to modify DOS to work with the new device. Hard-disk manufacturers usually provided a converted BIOS interface, replacing the one in IBM's DOS and containing the device drivers needed to operate their hardware.

Peripheral manufacturers had no convention to follow when writing a device driver. So, if a user installed more than one non-IBM device, a conflict could arise between two or more device drivers—usually over memory or interrupt control. Often, one peripheral could be operated only if the other wasn't.

DOS 2.0 separates all device driver components into individual modules and gives

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VERSION 2.00
DOS

users control over which module to use in their computers. It's now a relatively trivial task for even the unsophisticated user to modify a configuration. And peripheral manufacturers, instead of including a patch for DOS that limits the usefulness of their products, will simply include a device driver for the user to install.

By modifying a special file on the DOS 2.0 disk, called *config.sys*, users can configure their systems to work with new devices—no more kluged-together secondhand DOS that may or may not work with other devices.

Since *config.sys* is an ASCII file, it can be modified by Edlin or any DOS-compatible word processor or text editor; and, using the *type* command, you can list it on the screen. When you get DOS 2.0, take a quick look inside this file to see how simple the device installation process has become.

More Compact Disk Format. DOS 2.0 has a new disk format. Its benefits are obvious: 12 percent more disk storage. A single-sided disk, which previously stored 163,840 characters, can now store 184,320 characters. Double-sided disks that previously stored 327,680 characters can now store 368,640. Instead of eight sectors of 512 bytes each, DOS 2.0 allows nine. The increase in available space is not all free for the user; but when we take a closer look at the new format in future articles, we'll see that DOS 2.0 manages the newly found disk space so economically that overhead required by the system is almost insignificant.

There are some disadvantages arising from having two disk formats. Luckily, many of them are inconsequential to the user, because DOS 2.0 is designed to adjust, wherever possible, to the format it encounters on a disk whenever it reads or writes. For users with DOS 1.0 or 1.1, new features in the *copy* command permit transferring files from the old format to the new.

Improved Batch Mode. DOS 2.0 adds power in the batch mode by including *if* constructs. Now batch files (.bat) can define lines by labels—names assigned to each command line. The command processor can be made to *goto* a specified label, depending on whether some condition is met.

The number of replaceable parameters a batch file can use has been increased, and another new construct, *for*, has been added. These new abilities make DOS more functional for such repetitive tasks as the edit-compile-debug-edit cycle often used in programming.

Improved I/O Redirection. With DOS 2.0, input and output can be redirected among devices—at any time—by means of special characters on the command line. This allows for temporary redirection—a handy tool for debugging. Here DOS resembles its big brother Xenix, borrowing such Unix-like concepts as *pipes* and *filters.*

Intermediate forms of input and output can be processed by several Xenix-like filters (such as *sort*) before being piped to a destination. You could, for example, with one DOS command, issue the *dir* command, sort the directory listing, and send the output to a file.

They may seem complex, but these new capabilities are extremely useful. We'll explain them fully in future articles.

... AND THE PERSONAL COMPUTER XT

by Peter Norton

On March 8, IBM announced a new version of the pc, called the XT, along with a hard disk system and a new version of DOS. Here is a quick summary of what these announcements mean.

The best way to understand the new hardware is to start with the disk—a nonremovable Winchester-type system with a capacity of ten million bytes, equivalent to about thirty-two double-sided floppies. The power supply in the original pc is not hefty enough to handle the new hard disk, so owners of the regular pc who want IBM's hard disk have to get an expansion unit.

The expansion unit supplied by IBM is a case identical in size and appearance to the pc's system unit. It provides slot space for eight expansion boards (six regular slots and two short ones), a new power supply with enough horsepower for the hard disk, and the hard disk system. Like the system unit, the expansion unit provides two spaces for disk systems; one is used by the hard disk, and the other is available for either a floppy drive or a second hard disk. The cost of the expansion unit, with hard disk and controller board, is $3,390.

The Personal Computer XT (for *extended*) is a new version of the pc—but not really a new model and certainly not a new computer. Basically the XT is a pc with a bigger power supply, so that the hard disk can be brought aboard instead of being put into an expansion unit.

Under the cover there are some differences in the XT, but they're minor. The slot spacing was made about a quarter inch narrower to create room for six long and two short expansion boards. (Some of the fatter expansion boards, particularly piggybacked double boards, may be too wide for the new slots; this is the only incompatibility between the old pc and the new XT.) The system board now has room for 256K of memory. There is one other minor change: The XT does not have a cassette interface. IBM has still not announced the 8087 arithmetic coprocessor for the pc or XT, but the XT still has an open socket for an 8087.

Basically, then, the new XT is nothing more than our old pc with a hard disk installed. But IBM's marketing of the XT shows an interesting new twist and tells us some things about what IBM considers important and where it sees the Personal Computer going.

Whereas it has been possible to buy a pc stripped down, the XT comes loaded. It has the hard disk, of course, and a double-sided floppy drive in the other disk opening. It comes with a minimum of 128K, apparently IBM's new idea of a minimum reasonable memory size. It also comes with an asynchronous communication board; it isn't built in (it occupies a slot), but all XTs have it. IBM now considers communications capability so important that it wants every machine to have it.

There is also an expansion unit for the XT. It's identical to the expansion unit for the pc, but it's cheaper, simply because the XT already has a hard disk controller board and doesn't need another one.

Both the regular pc and the new XT can have one or two hard disks and one or two floppy drives. There are some minor changes to the ROM BIOS for the hard disk system: The XT comes with the new ROM (see "Snooping in ROM: Which Version Did You Get?" in *Softalk*, January 1983), and the expansion unit for an old pc comes with these new chips.

To support the hard disk system is the long-awaited 2.0 version of DOS. The new DOS has many exciting changes in it, but the biggest new feature is hard disk support. The old 1.1 version of DOS isn't dead, though. The new version eats up twice as much memory as the old one—24K rather than 12K. Since there are a lot of 64K pcs out there and a lot of programs that just barely fit into a 64K system, DOS 1.1 will continue to exist. As IBM put it, DOS 2.0 "does not supersede" 1.1. Nevertheless, the handwriting is on the wall for 64K systems; it's the old story—move forward or be left behind.

A particularly useful capability permitted by I/O redirection is the storage of program output in a disk file; output that would normally go to the screen is simply redirected into a file. Creative programmers now have a powerful tool for debugging programs. The converse of this feature is the ability to store program input in a file, redirecting input from the keyboard to a disk file. Think of this as another type of batch operation—except at the application program level rather than the operating utility level.

DOS 2.0's pipe and filter capabilities should inspire new and better software designs to automate some tasks now performed manually.

ANSI Escape Sequence Cursor Positioning. Important to the "techies" out there is DOS's support of the American National Standards Institute's 3.64-1979 and the International Standards Institute's 6429 specifications for terminal cursor addressing. These standards describe how nondescript terminals may be attached to an operating system and operated correctly.

Essentially, both ANSI and ISI standards describe ways to position the cursor and set certain terminal attributes by sending serial strings of characters to the terminal. These strings all begin with the ASCII escape character and are known as ANSI escape sequences.

This ability permits programmers, with minimal redundant work, to develop software for compatible computers, regardless of terminal characteristics. This feature also permits the reassignment of alphabetic keys on the keyboard, a usage difficult to appreciate but perhaps valuable for special applications.

This facility is of little interest unless you are the rare user with a remote terminal attached to your pc, but it provides much-needed utility to software developers with products that operate on other MS-DOS computers.

The escape-sequence feature is installed by placing a reference in the *config.sys* file to a special extended screen and keyboard control device driver on the DOS 2.0 disk.

Upward Compatibility. Unfortunately, software developed on one version of an operating system is often incompatible with subsequent versions of the system. DOS addresses this drawback of software technology by providing for the transfer of existing software onto the new system.

Some programs written for DOS 1.0 and 1.1 will not run under DOS 2.0, through no inadequacy of DOS. Programs that do not make—or worse, bypass—the proper operating system calls, or that make direct BIOS calls, probably will not run under DOS 2.0. Also, because of changes in the way the File Allocation Table is handled, programs that directly manipulate the FAT may not work.

DOS's additional capabilities are not without cost: the new version uses considerably more memory. IBM recommends 64K for systems running DOS 2.0, and 128K if you use a hard disk. Some programs that don't use multiple memory segments may be too large to load and run under DOS 2.0. Adding RAM to your system should be a fair exchange for its new capabilities.

Appendixes to the DOS 2.0 manual address problems with IBM-supplied software. To upgrade independent-vendor software to DOS 2.0, contact the retailer or the manufacturer. Any programs written in IBM-supplied Microsoft languages should work without modification.

Internal Commands. There are more internal DOS commands with version 2.0, primarily because of its hierarchical directory structure. Following is a list of memory-resident commands, with changes noted.

Dir. Minor differences.

Rename. Same.

Erase. Same, except for enhancements to manage paths.

Type. Same, except for enhancements to manage paths.

Copy. Same, except for enhancements to manage paths.

Date. Same.

Time. Same.

Ver. New. Prints DOS version number.

Chdir. New. Changes the current directory of a specified drive to a new directory specified by a pathname.

Mkdir. New. Creates a new directory or subdirectory.

Rmdir. New. Deletes an existing directory and its contents.

Break. New. Turns on and off all the checks to see if the user has typed control-C.

Verify. New. Turns on or off the facility to verify data after a disk write.

Path. New. Sets the command search path through directories. (We'll discuss this important new DOS command fully in future articles.)

Vol. New. Displays on the screen a specified disk's volume identification name.

Ctty. New. Selects standard input and output devices.

Set. New. Sets the environment by defining and aliasing strings for the command line interpreter.

Batch Mode Commands. DOS 2.0 enhances batch operations tenfold. DOS itself can now determine if certain conditions exist and then acts accordingly.

Rem. Same.

Pause. Same.

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Echo. New. Enables or suppresses printing of commands to the screen during batch file processing.

Goto. New. Used with labeled lines in a batch file; can transfer control to a specific batch file line.

Shift. New. Shifts replaceable parameters to give users more than the ten previously allowed.

If. New. Invokes commands based on the condition of some test; considerably enhances the functioning of the batch processor.

Cls. New. Allows batch files to clear the video display.

External DOS Commands. As with DOS 1.0 and 1.1, machine-readable files with .com or .exe extensions are external commands. Consequently, many existing DOS external commands will work without modification.

Format. Same, except for new switches for formatting disks for version 1.1 or 2.0, which differ in physical layout of sectors. Assigns volume names for disk identification.

Chkdsk. Same, except for new switches.

Edlin. Same, but invokes minifile editor.

Debug. Same, but invokes enhanced debugger.

Sys. Same.

Diskcopy. Same.

Diskcomp. Same.

Mode. Same, with minor modifications.

Assign. New. Instructs DOS to use a different drive from the one specified.

Backup. New. Copies files from hard disk to floppy.

Restore. New. It does the opposite of *backup*.

Tree. New. Displays all directory paths on specified disk; displays files on more than one directory.

Recover. New. Reconstructs damaged disk directories from the FAT. Removes bad sectors from files for partial data recovery.

Print. New. Prints files in background while computer operates other programs.

Exe2bin. Same.

Prompt. New. Allows user or application program to set the system prompt.

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Find. Filter command. Sends to the standard output device all lines containing a specified string found in a specified file.

More. Filter command. Reads data from standard input device and passes it one screenful at a time to the standard output device; displays message, "-----more-----" between screens and pauses until a key is pressed.

Sort. Filter command. Sorts data from standard input device and routes it to standard output device.

Piping of standard input and output. Allows data being output from one program or command to be input to another. Data is held temporarily in a specially named disk file.

Config.sys. Contains special configuration information that DOS uses when booted; contains information for installation device drives, RAM drive settings, and so forth.

Summary. The changes in DOS are not trivial. The operating system has several new features and has streamlined many existing ones.

Applications software developers should find the increased resemblance to Xenix attractive; moving software between the two operating systems is greatly simplified. Xenix, of course, is a multiuser system not available to the pc. However, its introduction on the new Radio Shack Model 16, Apple's Lisa, and several less visible systems, such as the Altos, is significant to the software community. It should mean more software for the pc, as well as the migration of pc software to the Xenix world.

Next month we'll examine the philosophies and methods for hierarchical file structures with multiple directories. ▲

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SYSTEM NOTEBOOK

by Alan Boyd

This month, instead of delving deeper into the mysteries of the pc's system software, we're going to answer some readers' questions. A few are technical, but most stem from confusion about software capabilities.

By far, the most-asked question is, "Which operating system should I use with the pc?"

This column has discussed PC-DOS from the beginning, so the answer from our point of view is fairly obvious. Those asking this question probably have, or are upgrading from, eight-bit computers with the CP/M-80 operating system—undoubtedly the prime force in the eight-bit world.

But the verdict is in for the sixteen-bit world. Results from a recent survey by Dr. Portia Isaacson of Future Computing (a Texas-based industry analyst), show that the vast majority of pcs have the PC-DOS operating system. The approximate breakdown:

PC-DOS	96 percent
CP/M-86 (including Concurrent CP/M-86), from Digital Research	3 percent
UCSD p-System (from all sources)	1 percent

Application software available for an operating system obviously will be proportional to that operating system's market penetration; PC-DOS is clearly the leader.

Many people ask, "Why should I purchase an IBM pc when most of the software is for eight-bit computers?"

Not true. Excepting the vast library of Apple II game software, all of the significant eight-bit software—including *dBase II*, *WordStar*, *VisiCalc*, and *EasyWriter*—has been adapted for the pc and runs under DOS. You can bet that manufacturers of packages not designed to run under DOS are busy translating them.

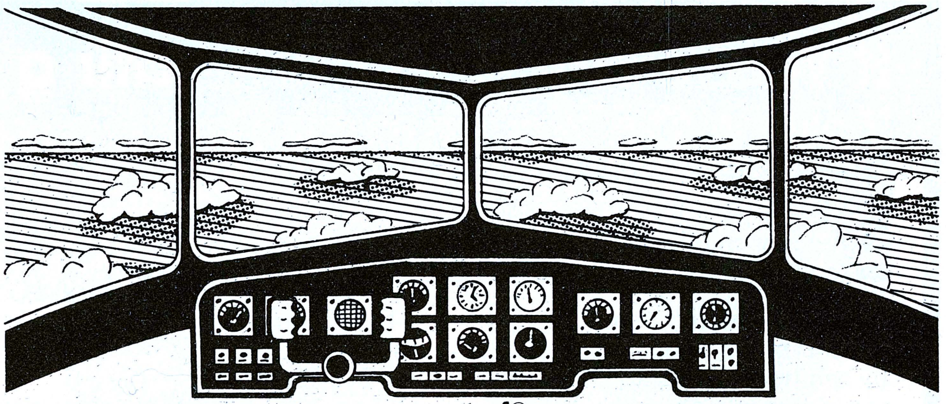
Another frequent question: "What do hardware manufacturers mean when they say their computers are IBM-compatible?"

Much of the compatibility confusion starts with DOS. PC-DOS is IBM's version of Microsoft's MS-DOS, but they are one and the same. This operating system is not proprietary to IBM; Microsoft can license it to any hardware manufacturer. Theoretically, then, any computer that can run MS-DOS should be IBM-compatible.

But, of course, it's not that neat and clean. Minor variations between PC-DOS and MS-DOS, including version numbers, have created confusion. Although MS-DOS 1.0 was released as PC-DOS 1.0, IBM's PC-DOS 1.1 was released by Microsoft and other hardware manufacturers as MS-DOS 1.25. Despite small but important differences, they're all the same operating system.

Numerous manufacturers have introduced computers that run under MS-DOS. Among them are Altos Computers, Canon, Columbia Data System, Compaq, Compusystems, Computer Devices, Corona Data Systems, Digital Equipment Corporation, Dynalogic, Eagle Computer, Hitachi, Intel, Mitsubishi, Nippon Electric Corporation, NorthStar Computers, Olivetti, Panasonic, Paradyne, Tecmar, Texas Instruments, Toshiba, Vector Graphics, Victor/Sirius, Wang Labs, and Zenith Data Systems. Owners and potential owners of these systems are interested in IBM compatibility because most software development is focused on the pc.

So, in addition to comparable operating systems, what constitutes compatibility? Essentially, there are three levels of comparison for computers claiming IBM compatibility. On the first level are systems that use MS-DOS but have a different storage medium from the pc. These systems can't access programs or data from disks manufactured on or for the pc. The NEC Advanced Personal Computer is in this category; it uses eight-inch disk drives. So is the Computer Devices Dot, which uses three-and-one-half-inch microfloppies. The Sirius/Victor machine has five-and-one-quar-



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ter-inch disk drives, like the pc, but its disk-formatting technique allows a much higher storage capacity.

Ironically, in this category too is IBM's own Displaywriter, which uses an Intel 8086 processor. The Displaywriter is software-compatible with the pc's 8088, and consequently with MS-DOS, but uses eight-inch disk drives.

For these computers to be pc-compatible, software vendors would have to make their products available on eight-inch disks, three-and-one-half-inch microdisks, and so forth.

The next level of compatibility includes systems operating under MS-DOS, using disk media consistent with the pc. These systems can read data written onto a disk by a pc, but they may not be able to run programs developed specifically for the pc. Many of these programs assume capabilities the pc has that other systems don't.

Few systems are totally compatible with the pc, and not necessarily because the pc is a better, more functional computer. To differentiate their products from the pc, some manufacturers make a machine with enhanced capabilities, perhaps using an 8086 instead of an 8088 or a higher-resolution graphics screen. In supplementing the pc's capabilities, many manufacturers sacrifice certain software compatibility.

There are two levels of data-interchange compatibility. Some systems—including Victor, DEC, Vector Graphics, and NorthStar—can read IBM pc disks, but the pc may not be able to read their disks. These systems tend to use disk drives capable of writing higher-density data formats than IBM's, although they generally can read data from lower-density disks.

Luckily, many machines—the Wang Professional Computer, Olivetti, Zenith Z-100, and the recently announced Texas Instruments—can both read and write disks compatible with the pc.

On the third level of compatibility are systems approaching all of the pc's functions; their manufacturers duplicated many of the pc's features. They read and write five-and-one-quarter-inch pc disks, and can run most software designed for the pc. In this category are Columbia Data System, both of the Corona Data Systems models, the Dynalogic, the Eagle, the Compaq, and, with five-and-one-quarter-inch disk drives attached, the Computer Devices system.

Programs that won't function correctly with these systems are those whose developers took liberties and bypassed the operating system. For example, some programs make direct calls to the BIOS instead of managing tasks as recommended, or directly use proprietary ROM code. Compatible-hardware manufacturers can't accommodate such programs, and it's mystifying why, to save a few milliseconds, software companies ignore a potential market for their products.

There is a fourth level of pc compatibility—the clone, an exact replica that behaves identically in every respect. A system that claims to be a clone must have all of the pc's features, including the pc's resident ROM chips and their code. This code is proprietary to IBM, even though it's published in the *Technical Reference* manual. Duplicating the code is illegal, and so, consequently, is creating an exact pc replica. There is no pc clone and, legally, never will be.

Other factors besides data interchange contribute to true compatibility. Consider disk drives. IBM uses the popular Tandon five-and-one-quarter-inch, forty-eight-track-per-inch drive, readily available on the market. A system that runs MS-DOS and can interface to a Tandon drive generally is more compatible because it can read and write pc disks. Although a ninety-six-track-per-inch drive provides twice the storage capacity, these systems usually can read, but not write, disks in the pc format.

To use documentation that accompanies commercial software packages, most compatibles have keyboards similar to the pc's. Some don't have the same function keys, but

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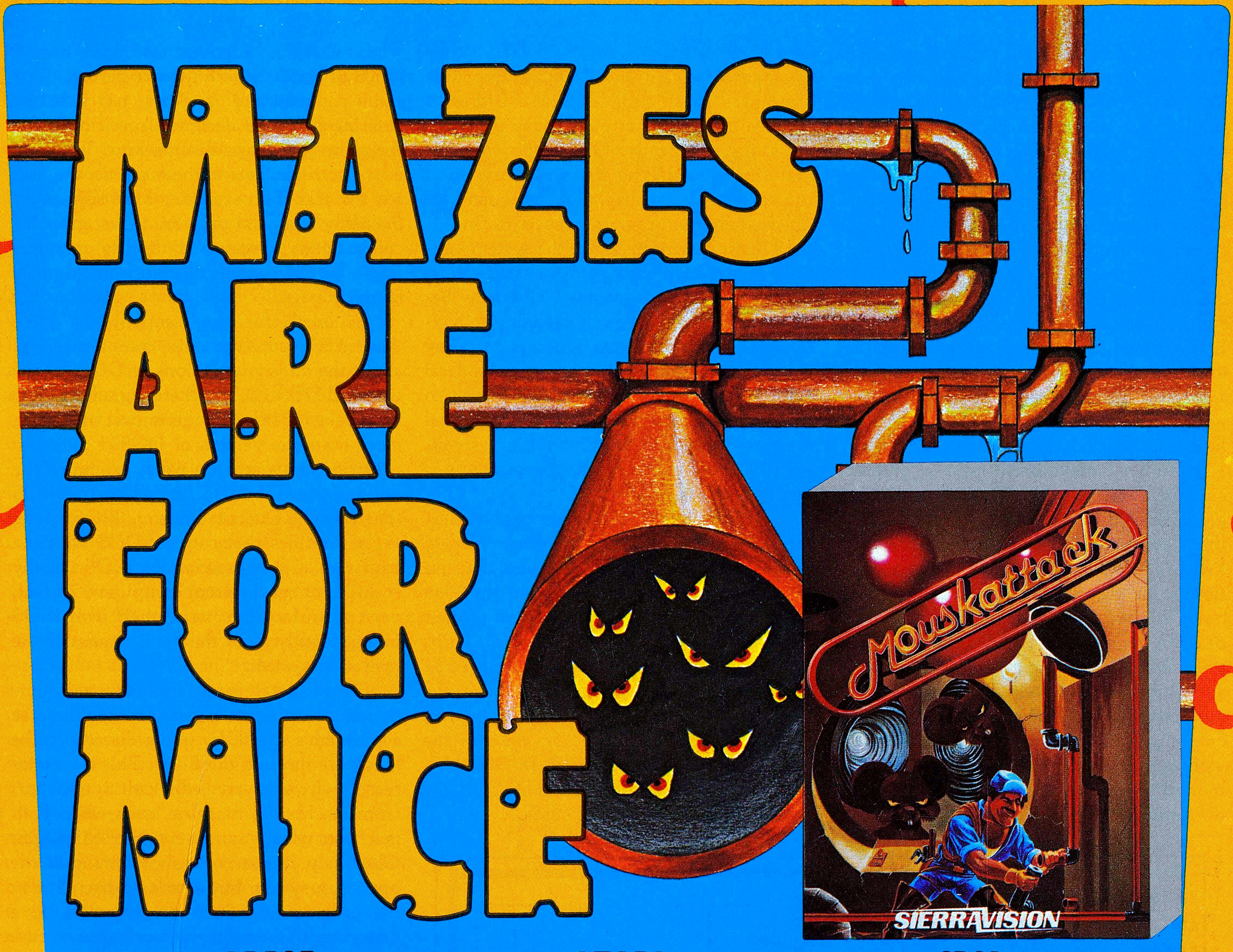
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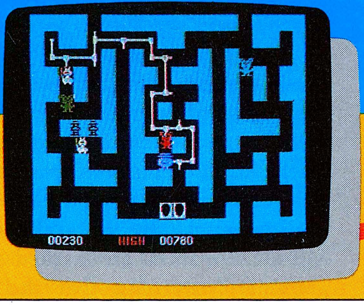
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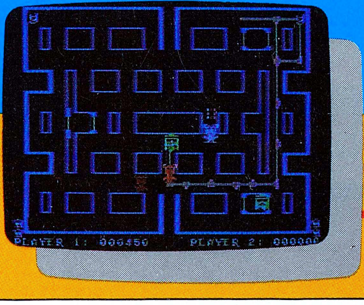
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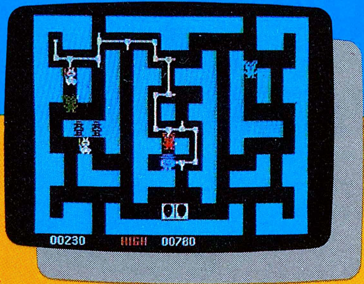
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Keytronics, a keyboard manufacturer in Spokane, actually makes an enhanced version of the pc keyboard. All of the keys are similar, but the ergonomics of the layout have been modified. Some pc users disliked certain key positions, particularly that of the enter key. Many pc-compatible systems use the Keytronics keyboard, which successfully reflects many documentation manuals.

IBM extended the traditional seven-bit ASCII character set (128 characters) into an eight-bit set (256 characters) to include symbols for foreign languages, graphics, mathematics, and even playing cards. Software designed for the pc extended-character set may not run properly on compatibles that don't have additional or modified characters.

Another compatibility issue is graphics support. The pc uses the Motorola 6845 graphics chip and maps the graphics screen into a specified area in addressable memory. When a program changes a memory location in the graphics memory map, the 6845 modifies the display, turning pixels on or off or changing from one color to another. To be pc-compatible, a computer needs a 6845 or something that behaves like one, and the video screen memory map area has to coincide with that of the pc. The pc has two areas assigned for video displays, one for the monochrome card and one for the color/graphics card. Address space for the monochrome card starts at hex B0000; for the color/graphics card, hex B8000. Compatible computers must duplicate these addresses because programs can manipulate these address spaces directly. Obviously, software that directly addresses video memory won't run correctly if the display memory isn't located where the program expects to find it.

This argument holds for the system's entire memory map. Compatible systems must duplicate the pc's memory structure because the pc uses memory mapping to control many of its facilities. Memory mapping permits a computer to operate peripheral equipment simply by reading and writing to and from certain predetermined and fixed memory locations. In compatible systems, each of these memory-mapped locations is identical to the pc's.

Some machines are bus-compatible; they can accept peripherals and other plug-in cards designed for the pc. Systems that use the Intel 8086 processor instead of the 8088 are *not* in this category. In addition to their relative processing power, these two chips differ in the number of data lines used. To be bus-compatible, a system must have the same bus-wiring configuration as the pc, have an 8088 microprocessor, *and* run the processor at the pc's speed (4.77 MHz). Running the system faster could affect the performance of peripheral cards.

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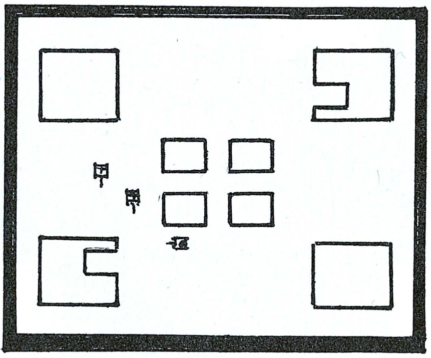

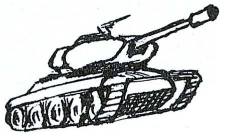

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Obviously, a computer must match much of the pc's performance before it can claim compatibility. The best test is to try running software designed specifically for the pc on the compatible machine. The closer the software gets to the machine, the better the test. For example, *Microsoft Flight Simulator* is a good program to test graphics compatibility, because it directly manipulates the 6845 graphics chip and graphics memory page.

So much for the compatibility question. Let's consider the question asked about the different versions of DOS. Those who had DOS 1.0, and then upgraded to 1.1, have asked, "What is the impact of having more than one version of DOS?"

In previous articles, we've examined the various parts of DOS, including the BIOS (Basic Input/Output System). BIOS is the set of routines that connect DOS with the hardware. Consequently, the BIOS usually is different for different computers; in fact, most manufacturers write their own BIOS independently from the development of the operating system.

Overzealous programmers, as mentioned earlier, often bypass DOS to increase a program's speed, by going directly to the hardware through the BIOS. This is a major reason why software is difficult to transport from machine to machine, even when both machines use the same version of MS-DOS. Obviously, this is not a shortcoming of the operating system but a lack of discipline in the programmer. Such programmers do a disservice to themselves as well as their customers. Their programs are static and may be rendered useless as new versions of DOS are released.

This leads to the issue of DOS's supported and unsupported features. Those features not documented in the DOS manual will change as the product matures. Listings of the BIOS and some other things in the *Technical Reference* manual are for information purposes only. Several passages in the MS-DOS manual are marked "Caveat Programmer," warning that the documented feature is unsupported and subject to change. To develop software for several machines that support MS-DOS, and not just the pc, programmers should use more than one machine and compare documentation.

Another trap for programmers, borrowed from eight-bit days, is the old trick of stealing space. When processors could address only 64K of memory, or less, programmers often crammed as much code into as little space as possible. To do this, they would "steal" some memory from the operating system, essentially overwriting parts of the operating system code containing features their programs didn't need. In new versions of DOS, those code segments may change their physical locations in memory. Application programs that modify DOS have totally unpredictable results.

Another problem is that the physical format of the disks themselves may change. DOS tends to accommodate disk interchange. Older operating systems didn't allow users to change disks during a program without resetting the operating system, but DOS permits the removal of disks not in use and their replacement with others. But programs that manipulate the directory or the file allocation table can easily make a mess of a disk that has been inserted in place of another, particularly if the disks were created under different versions of the operating system.

There's one simple rule for using operating systems: keep the operating system current for programs that produce DOS files or interact with other programs. Whenever a new version is released, update all of your disks with it. If a particular program doesn't work with the new version, obtain an update from the vendor. When a program won't function with an updated DOS, it's either because the programmer broke the rules and bypassed DOS (the vendor should provide an update) or DOS has added new features or capabilities. The second situation simply has to be lived with.

As more and more is added to DOS, memory requirements inevitably will increase. In some cases, the sum of DOS's memory requirements and those of a particular software package will exceed available memory in small systems. The only solution is for the software vendor to recompile or reassemble the program. Adding more memory won't solve the problem for programs written to work only with 64K, regardless of how much memory the system has.

Generally, it's unwise to keep disks created under different versions of DOS. Be assured that whatever direction DOS takes, major features currently supported will always be supported. And DOS will always supply a mechanism for the upward transportation of data files. Whenever you receive a new version of DOS, immediately try to run all your software on it (but keep the old version until you're sure everything runs okay, just in case).

If the new version of DOS doesn't work with your copy-protected programs, consult your dealer or the software vendor. Games are an exception. Low-ticket copy-protected software, like games, probably isn't designed to make use of advanced features of DOS. Don't upgrade them; once you have this type of program working, leave it alone.

Next month we'll dig a little deeper into some new and exciting DOS features. ▲

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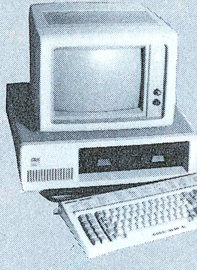

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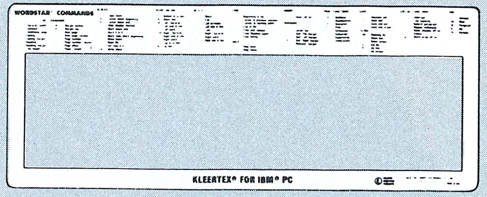

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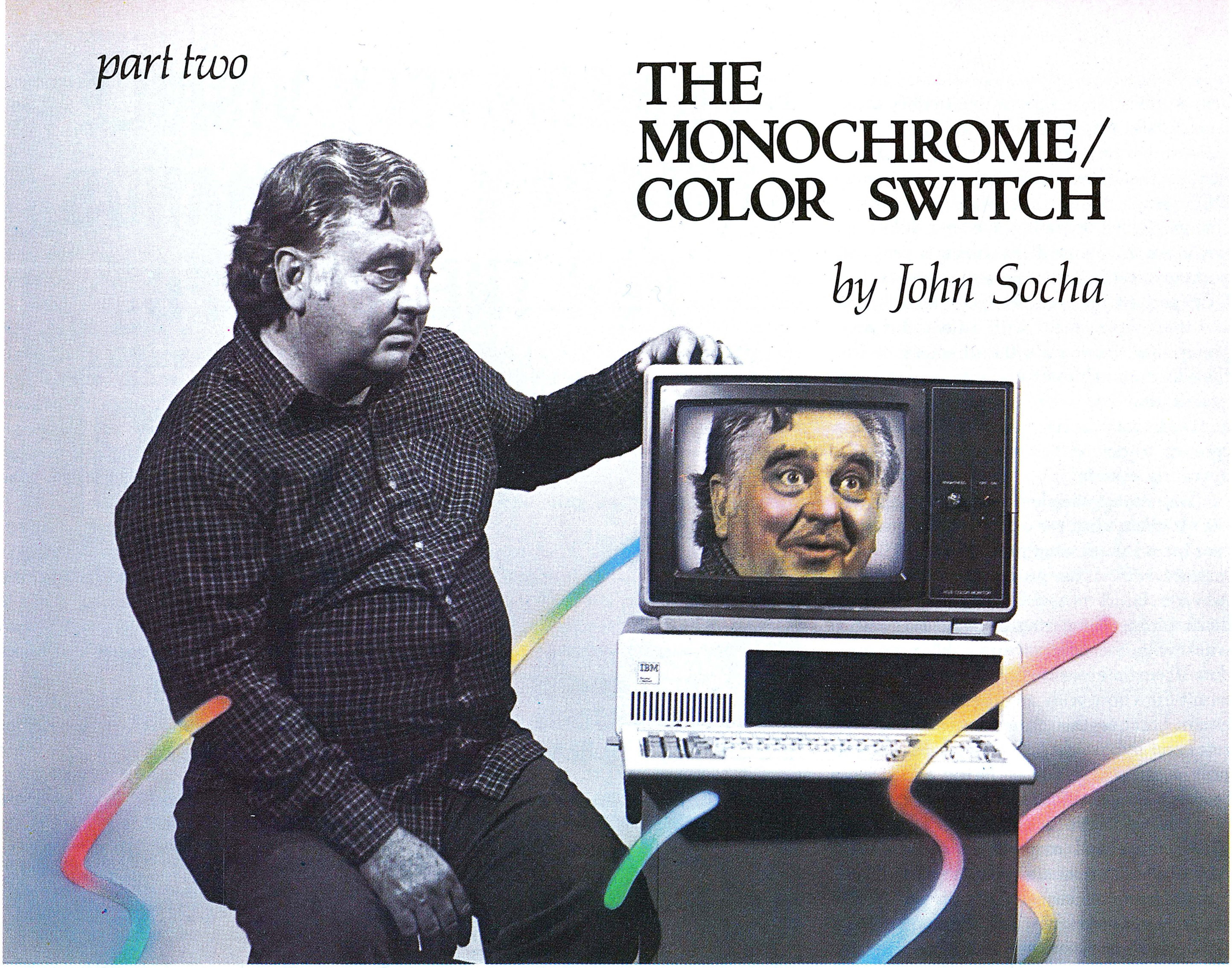

part two

THE MONOCHROME/ COLOR SWITCH

by John Socha

The February 1983 *Softalk* included a program called Switch to switch between the monochrome and color/graphics displays. One reader wrote:

> I entered the code and it works fine. Color40.com and mono80.com leave a blinking cursor on the previous screen. SWITCH leaves both the cursor and text on the previous screen. This can be very helpful in some situations but I wonder if it's possible to clear the screen before switching, as Basic does with *cls* and then a *locate* ,,0 which clears screen and blanks the cursor.
>
> Guy Pinte
> NYPC User Group

Switch2 does just that. You don't need the February article to create Switch2, and you need no knowledge of machine language to enter this program. Just follow the instructions.

Creating Switch2. We'll be using Debug.com, which is on your DOS 1.1 disk. Our first step is to enter the debugger. At the cursor, type

```
DEBUG SWITCH2.COM
```

"File not found" appears on the screen. This is precisely what we want. We called Debug and attempted to load the file Switch2.com, which we haven't created yet. Debug has stored certain information about this nonexistent file to use when we write our machine language program to the disk. The hyphen on the screen is Debug's prompt character. Now enter the machine codes for Switch2.com, pressing enter after each line.

```
E  DS:100  B8  40  00  8E  D8  B5  0F  B1
E  DS:108  00  B4  01  CD  10  B4  06  B0
E  DS:110  00  33  C9  B2  4F  B6  18  B7
E  DS:118  07  CD  10  32  E4  8B  1E  10
E  DS:120  00  8B  CB  81  E1  30  00  33
E  DS:128  D9  81  CB  20  00  B0  02  83
E  DS:130  F9  30  74  06  81  CB  30  00
E  DS:138  B0  07  89  1E  10  00  CD  10
E  DS:140  CD  20
```

To see if the program is correct, type

```
U  DS:100  140
```

This unassembles the machine code so that we can check our program at the mnemonic level. Except for the 04B5 before the colon on each line, you should see exactly

```
04B5:0100   B84000   MOV   AX,0040
04B5:0103   8ED8     MOV   DS,AX
04B5:0105   B50F     MOV   CH,0F
04B5:0107   B100     MOV   CL,00
04B5:0109   B401     MOV   AH,01
04B5:010B   CD10     INT   10
04B5:010D   B406     MOV   AH,06
04B5:010F   B000     MOV   AL,00
04B5:0111   33C9     XOR   CX,CX
04B5:0113   B24F     MOV   DL,4F
04B5:0115   B618     MOV   DH,18
04B5:0117   B707     MOV   BH,07
04B5:0119   CD10     INT   10
```

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```
04B5:011B  32E4       XOR   AH,AH
04B5:011D  8B1E1000   MOV   BX,[0010]
04B5:0121  8BCB       MOV   CX,BX
04B5:0123  81E13000   AND   CX,0030
04B5:0127  33D9       XOR   BX,CX
04B5:0129  81CB2000   OR    BX,0020
04B5:012D  B002       MOV   AL,02
04B5:012F  83F930     CMP   CX,+30
04B5:0132  7406       JZ    013A
04B5:0134  81CB3000   OR    BX,0030
04B5:0138  B007       MOV   AL,07
04B5:013A  891E1000   MOV   [0010],BX
04B5:013E  CD10       INT   10
04B5:0140  CD20       INT   20
```

Your program may have a number different from 04B5, depending on the amount of memory you have; Switch2 will work in any event.

If you find an error, simply exit Debug (by typing *g*) and start over. You'll only have to create Switch2.com once, so hang in there.

If your program is correct, now enter the command

```
R BX
```

Debug will respond

```
BX 0000
:
```

Type

```
0
R CX
```

Debug responds

```
CX 000
:
```

Type

```
42
```

and you're done. This last group of commands tells Debug that the program is sixty-six (42 in hex) bytes long.

Now you can write the program to disk, by typing

```
W
```

The message "Writing 0042 bytes" will appear on the screen. Quit Debug with a *g* and return to DOS.

To check that the program works, enter *switch2*. On your color screen, you should see a blinking cursor after the DOS prompt. Your monochrome display should be blank—no text, no cursor. If it isn't, you'll probably have to reboot the system, erase Switch.com, and start over. If you know enough about Debug, simply change the erroneous bytes.

Switch2 switches to the eighty-column, no-color mode of the color/graphics display. If you want the eighty-column color mode or the forty-column color/graphics mode, it can be done. To change Switch2 so it switches to the forty-column black-and-white mode, for example, type

```
DEBUG SWITCH2.COM
E CS:12E
```

You'll get the following response:

```
04B5:012E 02.
```

with the cursor at the end of the line. Type a zero, press enter, then type *w*, to write the file to disk, and *g*, to return to DOS.

The number 0 represents one of the seven modes for the graphics display adapter:

0	40 column, black and white
1	40 column, color
2	80 column, black and white
3	80 column, color
4	320 by 200 pixel, color graphics
5	320 by 200 pixel, black and white graphics
6	640 by 200 pixel, black and white graphics

You can substitute any of these numbers for the 0 used above. With 4, for instance, *switch2* would switch to the 320-by-200 pixel graphics mode.

How Does It Work? The February article illustrated how Switch switches displays. The only difference here is that Switch2 clears the screen and removes the cursor before switching displays. How? We used two routines in your pc's ROMs; one controls the size of the cursor and the other scrolls the screen.

Each character is formed from pixels—small dots that blend together. If you look very closely, you'll see these pixels. The monochrome display places pixels for a character within a small box nine pixels wide and fourteen pixels high, while the color/graphics adapter uses a square box eight pixels wide and high. The cursor is two lines high and as wide as the box, but we can change this. Switch2 moves the cursor outside of this box by telling the ROM routine to change the cursor to begin on line 15 and end on line 0, which is impossible. The consequence is that the cursor is placed outside the character box and you don't see it.

Clearing the screen is easier. The ROM routine for scrolling the screen can also clear the screen. See pages A-43 and A-44 of the *Technical Reference* manual for details on these two routines.

The Assembly Language Program. Following is a full listing of Switch2, which is fairly straightforward. Consult the February article for additional details.

```
;--------------------------------------------------------;
;   This is an assembler program in '.COM' form. Will not run as .EXE   ;
;                                                        ;
; Set up address for the data used by the ROM BIOS.      ;
; The equipment flag can be changed to fool the system into thinking    ;
; that the color-graphics board exists instead of the monochrome board. ;
;                                                        ;
;  <---------|---------> EQUIP_FLAG                      ;
;                ^ ^ --display type.                     ;
; display type: 1 - color card 40 X 25                   ;
;               2 - color card 80 X 25                   ;
;               3 - monochrome display                   ;
;--------------------------------------------------------;

ROM_BIOS_DATA   SEGMENT  AT 40H
RS232_BASE      DW       4 DUP(?);Addresses of RS232 adapters
PRINTER_BASE    DW       4 DUP(?);Addresses of printers
EQUIP_FLAG      DW       ?                ;Installed hardware.
ROM_BIOS_DATA   ENDS

;--------------------------------------------------------;
; This is the start of the executable code.              ;
;------------------------------------------------------  ;

CSEG      SEGMENT PARA    'CODE'
          ASSUME CS:CSEG,DS:ROM_BIOS_DATA
          ORG     100H                  ;Set starting point for a COM file.

SWITCH:   MOV     AX,ROM_BIOS_DATA      ;Set up data segment to point to data
          MOV     DS,AX

          MOV     CH,0FH                ;Remove cursor by placing out of display range.
          MOV     CL,0
          MOV     AH,1                  ;Set cursor type, to clear cursor
          INT     10H

          MOV     AH,6                  ;Scroll screen to clear old screen
          MOV     AL,0                  ;Blank entire screen
          XOR     CX,CX                 ;Upper left corner at 0,0
          MOV     DL,79                 ;Lower right corner at 79,24
          MOV     DH,24
          MOV     BH,07                 ;Fill attribute bytes with 7 for normal display
          INT     10H                   ;Clear screen.

          XOR     AH,AH                 ;AH = 0 calls for set-mode function
          MOV     BX,EQUIP_FLAG         ;Get the current equipment flag
          MOV     CX,BX                 ;Make a copy of the flag
          AND     CX,30H                ;Pick off the display information
          XOR     BX,CX                 ;Erase current display information
          OR      BX,20H                ;Set to color display, 80 X 25
          MOV     AL,2                  ;BW 80 X 25 mode
          CMP     CX,30H                ;Was it set to the monochrome display?
          JE      S1                    ;Yes, then set to BW, 80 X 25
          OR      BX,30H                ;No, set to monochrome display

          MOV     AL,7                  ;Monochrome mode
          MOV     EQUIP_FLAG,BX         ;Write flag back to memory
          INT     10H                   ;Make request to BIOS to set display mode

          INT     20H                   ;Return to DOS

CSEG      ENDS
          END     SWITCH
```

▲

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EXEC VISICORP

Number One Tries Harder

by Dennis Briskin

Except for its top management and corporate philosophy, much has changed at the company that brings you *VisiCalc*, including its name. When Apple *Softalk* profiled the *VisiCalc* people in October 1980, Personal Software was a Sunnyvale, California, company with a staff of fewer than thirty and annual sales of less than $2 million.

Softalk for the IBM pc recently returned to the corporate home of Terry Opdendyk and Dan Fylstra to find the company with a new name, VisiCorp, a much larger home in San Jose, a twenty-fivefold increase in sales, ten times as many employees, and a more intensely focused, innovative product line aimed at a broader, more difficult market.

"Two years ago the industry was selling to the computer knowledgeable," says VisiCorp president Opdendyk, pointing to one of the major changes facing his exploding company. "A year ago we sold to the computer-tolerant. With today's sales volumes we're selling to the computer-hostile.

"We're trying to reach the person who says, 'I'd rather touch my pad and paper to solve my problem than deal with a computer.' We offer an alternative that says you don't have to learn computerese and read manuals. If you can point and select, you can handle things in ways that are familiar, like sheets of paper in a desktop environment."

This point-and-select, desktop feeling is a key selling point for *VisiOn*, the company's new productivity tool for the IBM pc (and others soon). *VisiOn* integrates software applications to make it easier to learn and use the six most common generic computer tasks: spreadsheets, word processing, database management, graphics, scheduling, and communications. It also aims to meet the need to work with more than one application at a time and to transfer information quickly and easily among them.

Mice and Men. *VisiOn*, and its new Apple competitor, Lisa, also use a new style of cursor control, called a mouse, that allows the user to point to the name of a command shown on the screen and execute the command by pushing one button. No more control keys and codes to learn. No more tedium in moving data. And *VisiOn* can move from machine to machine because it runs "above" the level of the operating system.

Dan Fylstra, VisiCorp board chairman and chief executive officer, says, "This company has gone through some fairly significant changes in response to how the market has changed. When the company began in 1978, we concentrated on marketing and distributing other people's software. We also concentrated on the personal computers that were then available, like the Commodore Pet and the Apple II without disk drives. Since they were suitable for games, we got into strategy games."

As the machines and market changed, so did VisiCorp. "Machines like the Apple II with 48K and two disk drives, and the IBM

EXEC VISICORP

Chairman Dan Fylstra (left) started VisiCorp as Personal Software, working from his Cambridge, Massachusetts, apartment. Terry Opdendyk (right) joined the company as president in 1980, having previously served as director of quality assurance for Intel.

pc with floppies, made possible a new class of software that you couldn't do before," he says. "We pioneered the desktop use of the personal computer for individual business applications. That's now a large market that everyone understands."

Fylstra is betting that continuing to deliver products to make office work easier and more efficient will propel VisiCorp to the top of the information society.

"We have real ambitious plans," he says. "We're a middle-sized company on the way to becoming a large company."

He sees their challenge as not only bringing full-scale electronic capability to the office but doing so at a low enough cost to make it spread to *millions* of users.

"Part of the problem," he explains, "is offering this capability on a machine that can be manufactured in enough volume. I think we're just right on that count. *VisiOn* will run on the kinds of personal computers that will ship by the many hundreds of thousands this year. If we can bring that capability to a really broad audience, apart from doing well for VisiCorp, we will bring a significant benefit to a broad cross section of American industry, as well as Western Europe and other markets. I'd like to see us do that."

Narrowing its focus to software for office productivity meant big changes for VisiCorp, *nee* Personal Software. In 1980 they sold off a highly profitable line of home entertainment, education and game products. Why?

Because of what Opdendyk calls "the cultural climate of the company." Practically everything from research and development to market testing, product development, advertising, and distribution is done differently when you sell to business and professional customers rather than game and entertainment users, he explained.

Opdendyk describes doing business in the game environment as "fast-moving, creative, one-shot. Is it good? Will it sell? Can I get it out and move it fast?" It requires dealing with "quick fads, low tech, throwing out ten items to make a quick profit on one or two, and then moving on quickly." Everything about VisiCorp was different from that, he adds.

While acknowledging games as a highly profitable computer area, he says VisiCorp saw itself operating in "an environment that can last five or ten years, with systems level upgrades that can plug in data communications, tie into mainframes, and work in the home. These kinds of systems have different time spans, different tradeoffs, and different attitudes.

"We decided that we had the management resources to focus on the largest long-term growth segment of the personal computer business: sales to managers and professionals. VisiCorp is not now a personal computer software company. We are a company providing office solutions for professionals. That's a different market."

How big is that market? Opdendyk says studies show that 52 percent of Americans now work in an office environment, when you include all kinds of knowledge workers and self-employed professionals. That's about fifty million people who may soon use a personal computer.

"We're talking functions, not occupations," he adds. "The entire set of tasks in paper handling and information passing is our target market."

Racing for the Hurdles. In other words, VisiCorp wants to sell software to everyone—from your doctor to your doctor's nurse down to the clerk who processes claims at the medical insurance company.

But will they buy? To reach the "computer-hostile" millions, VisiCorp has had to find ways to overcome a number of barriers to computer use.

For corporate presidents like himself, Opdendyk says, "the barrier is that if it is easier to use a pad of paper and recorder to do what you're doing, you're going to use that rather than a keyboard. We're removing the intimidation by giving the top executive a metaphor in which he is comfortable," namely touching pieces of paper. Opdendyk has an IBM pc on his own desk but admits he uses it "selectively."

"Our goal is to better understand those things an individual doesn't use it for and to provide a functionality that makes it easier.

We're not trying to force someone onto a computer. But if we can improve accuracy, flexibility or time use, then we have created a product with high utility."

Data retrieval is an example of a task he says needs simplifying. "Right now databases are too complex and too computerish for the average user to approach." *VisiLink*, a VisiCorp joint venture with Data Resources of Lexington, Massachusetts, is aimed at simplifying this task.

"We don't expect anyone to be educated in how to get at the data. We'll do that for them transparently. If someone says, 'I want to see something about the ratio of nurses' salaries in Chicago to hospital bed costs,' he ought to be able to say that without knowing the data format and where the data is."

A more common computer barrier, one they feel confident they will overcome, is price. Fylstra cites a recent study from the Boston-based Yankee group of computer industry researchers that found large companies unwilling to spend more than $7,000 on computerizing their managers and professionals.

"The current generation of personal computers and what's happening with main memory and hard disk drives," says Fylstra, "make it possible to beat that threshold by a sizable margin. We think we are aiming ourselves just right to ride that technology curve." According to VisiCorp's product announcements, multiple applications on *VisiOn* will require 256K main memory and 640K disk storage.

One observer close to the computer industry suggests that another barrier may be the mouse. Opdendyk admits they were at first concerned about it.

"It was a question that stuck with us for a long time. Most of the company was very skeptical of the mouse." Yet the mouse is overwhelmingly preferred by users at various test sites, he says, especially when they have a choice of alternate devices.

"It looks like no manufacturer or independent retailer will offer any device other than the mouse just because of the preference factor," he adds. "Whether you prefer a mouse or a joystick or a track ball, *VisiOn* does not require a mouse. It assumes an x,y device through a standard RS-232 port. Users can substitute other devices if they want. Nothing requires them to use the mouse. The system's purpose is not to force you off the keyboard and onto the mouse."

Visicrop. While much has changed since 1980 (the name, location, size, and product line), the team of Fylstra, Opdendyk, and cofounder Peter Jennings (now vice chairman in charge of hush-hush research and development) has retained certain basics. They reverse the Peter Principle by hiring overqualified people and letting the company grow to their level of competence.

"We've done that by bringing in professionals who have worked in growth businesses of this type and have succeeded as managers at other levels of even larger companies than VisiCorp," Opdendyk says.

"We can't afford *not* to have the best people to continue to serve the market the way it needs to be served. We brought in people at all levels with far greater ability and talent than the local, immediate task demands. When you're in a market growing as rapidly as ours, as complex as ours, the demands on the individual and the company to meet the future expectations are immense."

He proudly lists some members of his management team: Tom Towers, vice president of marketing, formerly president of ITT's computer companies; David Spencer, director of marketing communications and merchandising, formerly advertising manager of The Clorox Company; Jeb Walker, in charge of major accounts in New York, formerly in charge of accounts for IBM; and Bob Gafford, publications director, formerly in publications at Digital Equipment and Intel.

President Terry Opdenyk explains VisiOn, *the company's integrated software support system for the pc.*

"These people are strong professionals in their areas and really understand their businesses," he says. "They are here to build a company that has long-lasting value. That, rather than quick, short-term goals or dollars, for ourselves or the company, has driven VisiCorp."

Opdendyk sounds almost pleased at the suggestion of having to pay more to get such people. "Absolutely, but the productivity is tremendously greater. The salary difference between a mediocre employee and the best employee might be 50 percent, but the output is greater by a factor of three, four, or five to one. Any company, no matter what its growth or industry, will have a greater net effectiveness of those salary dollars by getting the best people."

He points to the way sales have grown two and a half times faster than employees since 1980 as "a hard-dollar example of the productivity of high-quality, good people."

The company has two hundred full-time payroll employees and about an equal number of individual contract workers from several mentally handicapped workshops. These handicapped workers do all the assembly, packaging, and inspection. Opdendyk describes them as "fantastic. They have been an incredibly reliable, high-quality work force. Also cost-effective. They have been good for us and good for the community." He proudly adds that VisiCorp was chosen 1982 Handicapped Employer of the Year for the San Francisco Bay Area.

Fylstra emphasizes the need to treat the people well after they come on. Besides giving every employee stock options and cash

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profit sharing, he says, "we work hard to create a good environment for people. The starting point is the values and culture you try to create. We emphasize openness and participation, and having people deal directly with problems and be straightforward.

"Good people are attracted to other good people," Fylstra adds. "It's important to start with A people and keep hiring other A people. We have a lot of people who are attracted here by the chance to work with the kinds of people they meet here."

Like the rest of the computer industry, VisiCorp faces the serious, continuing problem of finding enough qualified people to keep pace with its expansion potential. "Our growth is limited by individuals," Opdendyk says. "We need experienced people who know how to work and succeed, who can communicate with one another. There is a tremendous shortage of people in computing sciences."

"We are looking for every good software engineer we can get," says Fylstra. "We want good, experienced product-marketing people. And managers in almost every part of the company. We're looking across the board."

VisiCorp has also continued to emphasize a small, superior product line for high-volume sales to a market it knows well. With *VisiOn*, the line contains only thirteen products.

"We believe a user in this area is better served by having the best possible products, as opposed to hundreds of products that may not have the right mix of capability or ease of use that he needs," Opdendyk says.

"We wanted to continue to develop the trend started by *VisiCalc* and personal computers in 1980," he says. "We have shipped seven hundred fifty thousand products into that market, which is more office automation than anyone else. We chose to pick an area we knew well and do one thing well." In dollar volume VisiCorp is still the largest supplier of software for personal computers, he adds.

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Like many top computer industry executives, Fylstra and Opdendyk put in long hours. "It would be easier to count the hours I don't work," says Fylstra. "The problems and responsibilities are on my mind all the time. I see so many challenges and opportunities and things we can *do*," he says. "It attracts me very much. It's not just the money, although the financial rewards are there. It's doing what we have set out to do. It's actually pulling it off."

Opdendyk says he never sits down to think about how many hours he works. "I'm usually here eleven to twelve hours per day. I work one day of the weekend at home. That's a change from two years ago when I was here a lot more often." To help relieve what he calls "a tremendous amount of stress," he sails and plays racquetball.

Failure To Anticipate Success. Despite their phenomenal success (*VisiCalc* has endured as a software bestseller), both Fylstra and Opdendyk acknowledge they have made mistakes and learned along the way.

"We've made all *kinds* of mistakes," Fylstra says. "Whenever you set out to do anything, just in the act of doing it, you make mistakes. You have to make more right moves than mistakes, and recognize them and correct them."

Opdendyk says that among their mistakes were underestimating how fast their sales would grow. Two years ago the estimate was 200 percent over four years. Instead they grew 2,400 percent (in dollar sales) in less than three years.

"We underestimated the price decline of hardware," he adds. "To be honest, we thought prices would be higher for our target systems. We thought it would take a few more years for the hardware technology to become a mass-market, commonplace system.

"We also underestimated the staying power of software. Products like *VisiCalc* and others have built up a tremendous amount of user data and surrounding services. Users want a commitment in time and energy from software manufacturers over a long period. They want to know you're going to be there and they want the product to be stable, so they can use the data and energies they put into it. They also want it to improve continually so they can take advantage of the technology.

"The fundamental tenet we have learned over the last two years is that the user has an insatiable demand for capability. The minute you enable someone to do something, they say, 'But now I've got to do these other things. I wish the computer could do that.' Every time the user does that, the complexity of the product goes up. But every time you deliver that complexity in an ease-of-learning, ease-of-use fashion, you enlarge your market tremendously."

Says Fylstra, "One of our maxims is that user expectations always rise to a point just beyond what can currently be delivered."

About what they have learned, Fylstra says, "This is the fastest-moving, fastest-changing industry. Companies that make software for mainframe computers have taken ten to twelve years to grow to the size we have in four years. Software products usually have lifetimes of seven to nine years. We are on our third major product-line evolution in four years.

"When I was at Harvard getting my MBA [1976-78] I was all excited about personal computers, but it was totally invisible to the popular culture. It took a lot of chutzpah to even tell others there would be these things called personal computers and that everyone would have them. It was a pipe dream.

"My classmates made a joke out of it and gave me the Dan Fylstra Computerized Universe Award because I was always talking about it.

"Yet here we are on the cover of *Time* and practically every other publication. Even *I* in my wildest dreams wouldn't have expected that it would happen this fast. It really is remarkable."

He pauses for a moment and with genuine awe in his voice says, "And on top of that, I don't see it slowing down."

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Lessons Learned. What has he learned to help him deal with it? He says, "Oh, there are the classical Silicon Valley Business Growth Principles: bring in venture capitalists; put smart, experienced people on your board of directors; use the best professional services. If you're in a start-up mode and money is short, there's nothing more expensive than a second-rate lawyer or accountant. You need to use the best of everything. Hire the best people and pay whatever it takes in salary and stock. Share the wealth and give people participation."

He might have added that it helps to be first. "It benefited us to start when we did," he admits. "We were pioneers in the market. We very consciously created a defensible position for ourselves. Now it's much more competitive, with enormous amounts of energy, expertise, and dollars being thrown into it."

Their competition is "almost anybody. In the short run it's people like Microsoft, MicroPro, and Digital Research, although they are largely in system software. Also Lotus and Context.

"Because of my role in strategic planning, I look more at the long-term horizon, where I view our competition as anybody with the capability and the desire to build our kinds of systems. The potential competition includes the systems vendors themselves, some of the larger-scale software vendors, even some of the larger publishers."

While calling these firms competitors, Fylstra says they can also be customers, suppliers, and participants. That's part of his strategy.

"We are certainly creating alliances," he says, "and looking for ways to extend our value added. We're highly interdependent with the hardware manufacturers. This wouldn't come about if companies like IBM, Apple, Tandy, and DEC weren't manufacturing those machines. We're trying to build software we can put across a number of different machines. We tend to pick the leading machines. Sometimes what we do helps make them the leading machines."

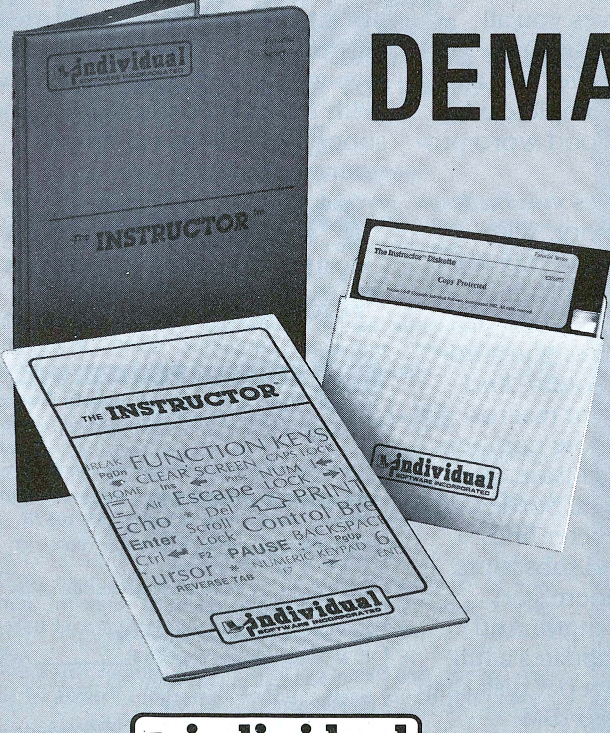
On VisiCorp's future, Fylstra speaks only generally. "The next big thing for us is the area of communications and networking, both locally and over common carriers." He won't say more except that basic to the *VisiOn* concept is interconnecting the personal computer with other office systems and computers. "It's a real important part of the long-term plan," he says.

Fylstra and Opdendyk have also been tightlipped about the price and first shipping date of *VisiOn*. Opdendyk does say that "*VisiOn* will cost the same as non-*VisiOn* products. It will be attractively and aggressively priced so that it's not an inhibiting factor or a consideration in whether to buy."

Yet Opdendyk may have let drop a price hint in talking about *VisiOn*'s generic programs and the highly specialized software (for example, an agricultural management program for a feed lot) that will be written by small outside firms to run within it.

"Highly specialized programs may cost typically ten times what *VisiOn* will cost because they have a smaller market to serve and a smaller number of users over which to amortize their costs. It's not unusual to see a specialized package that runs a couple of thousand dollars," he says.

What's a couple thousand divided by ten? If you take *that* number and multiply it by whatever you think VisiCorp's market share of 50 million knowledge workers will be (make it a large fraction, since *VisiCalc*'s popularity gives the company a flying head start), you can understand why Dan Fylstra takes a deep breath when he says, "We're trying to pull off something real ambitious." ▲



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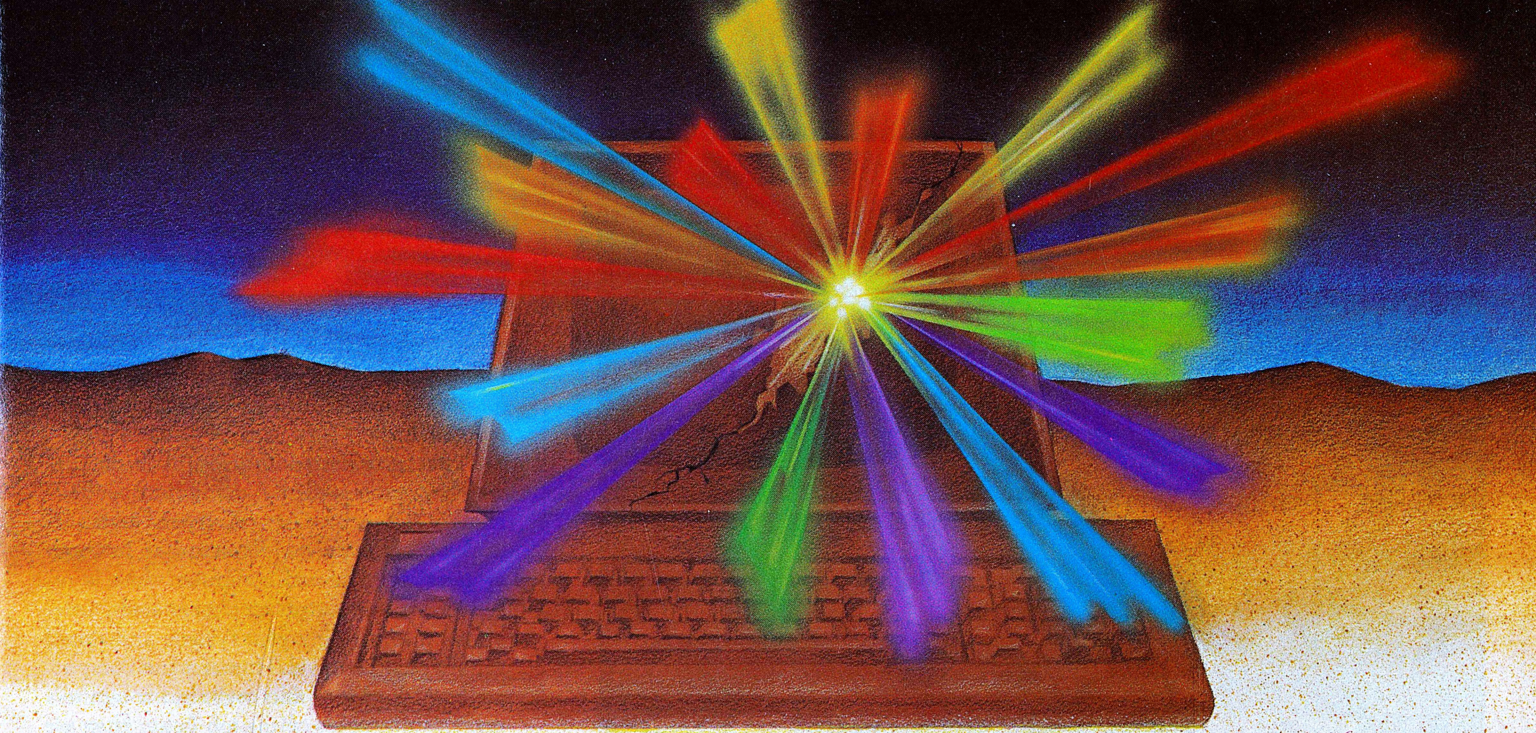

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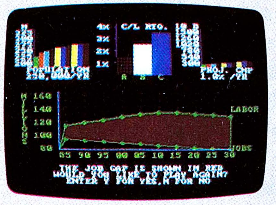

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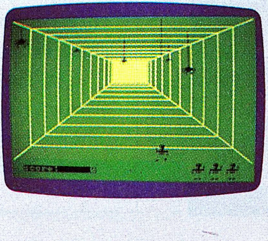

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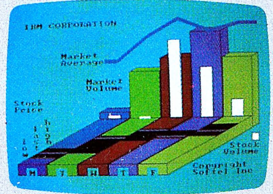

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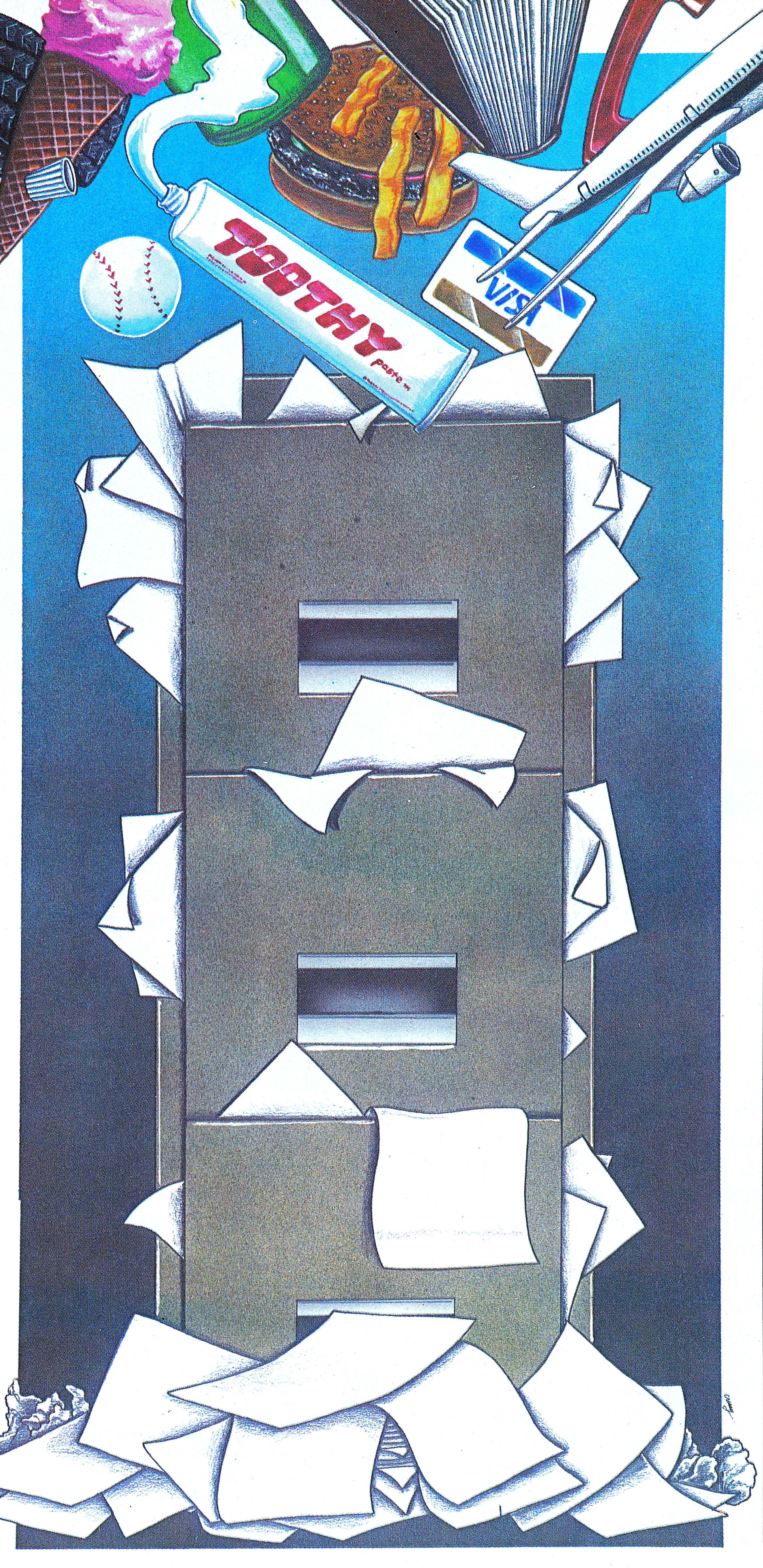

DATAB
An Int
to DBMS

by Spencer Leyton a

We live in an information society. Newspapers, journals, magazines, books, memos, reports, television, radio, and plain old conversation daily bombard us with data. And the quantity, already overwhelming, is on the increase. Our professional or educational success may depend on how well we manage that data.

The Information Process. Information, whether processed by computers or humans, consists of data—in bits and bytes, or in words, sounds, or pictures. In both systems, human and computer, data is received, manipulated or calculated, integrated into a meaningful system, and stored for selective retrieval. Humans and computers both do these tasks well, but computers do certain aspects of the job better than we do.

Computer programs that are specialized for information handling are generally known as database managers and come in a number of distinct flavors; in this article we'll describe the various kinds of database management systems available on microcomputers, and we'll offer a shopper's checklist of features to consider when you're in the market for a database manager.

Think of the *base* in database as similar to the base in military base. In the latter, equipment is collected, stored, and used in a particular location and arrangement. Data arranged for ready retrieval and use is a database.

You use databases all the time: telephone directories, library card files, dictionaries, cook books, the Sears catalog. Computer databases, like the kind you're already used to, list bibliographies, addresses, inventories, accounting records, and anything else requiring convenient retrieval. They differ from noncomputer databases not in what they store but in how they store and retrieve information.

A further distinction: a database is the collected, organized information; a database management system, commonly abbreviated DBMS, is the program than handles the

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nd David Intersimone

information—that stores it, organizes it, sorts it, retrieves and reports it, and in general makes information useful to you.

Real World Example. Let's consider the traditional system of file cabinets in a small business—any business. Let's say each cabinet contains information on a single subject—inventory, accounts receivable, or whatever. Properly labeled ledger cards, each with information about the subject, go into these cabinets. Together, the cards, information, and file cabinets make up the business's database, a structured grouping of information systematically stored for ease of access.

A file clerk retrieves information by selecting the proper cabinet and thumbing through cards until the required one, identified by its label, is found. The clerk—who understands how the file cabinets are organized and knows what kind of information is recorded on the cards (distinguishing inventory cards from accounts receivable, for instance)—is analogous to a database management system.

If the clerk is particularly crafty, he may choose to start each file with an index card that lists all the ledger cards' labels, along with their locations within the file cabinet. Then, when he needs to get a certain ledger card, he can examine the index card to find out exactly where to go in the file to retrieve the information he needs.

If the information stored in the file is sensitive, the clerk may ask the people using the files for passwords to make sure they are authorized to read, write, or make reports from the data.

People who have information to file in the system or need to retrieve information from it may use the clerk as a go-between. Among other things, the clerk verifies that any new information added to the cabinet is consistent with the organization of the data already stored.

The clerk and file cabinets provide a central collection of almost nonredundant data, and since only one clerk has to handle the

Illustrations by Mike Cressy

data it is likely to be consistent and accurate.

In this example, data items are written on ledger cards, which are organized into groups, each containing a body of related information; each group of cards is stored in its own file cabinet. The ledger cards are identified for storage and retrieval purposes by their labels.

Many database management programs use a similar filing structure. Data items are called *fields,* and the ledger-card analogs onto which they're written are called *records.* The records are organized into computer files, within which each record is identified by its *key* (equivalent to the labels in our example).

So, for instance, if the file is for accounts receivable, individual fields might record such things as account number, name, street address, city, state, zip code, amount currently due, and so on. All the information pertaining to a single account would constitute a record. The entire collection of records would constitute the file.

The *key,* by which a computer record is retrieved, is generally a particular field selected by the computer operator. One of the advantages of computer database management systems over their noncomputer counterparts is that records can easily be stored under more than one key. This provides the computer DBMS with automatic cross-referencing capability.

Here is a summary of the analogies between computer and noncomputer data management methods:

HUMAN DBMS	COMPUTER DBMS
file cabinets	files
ledger cards	records
data items	fields
labels	keys

Like the file clerk, the computer DBMS has to be aware of the structure of the information contained in the file. A computer DBMS records this structural information in what's called a *data dictionary,* which is stored in the file along with the other file data. The DBMS may search for records either sequentially (by looking through the file in order, one record at a time) or by means of an indexing scheme, like the one used by the crafty clerk of our example.

A Little History, Please. The term database management system comes from the mainframe computer world. When large computers were first introduced into a business, people from many different departments saw the computer as an alternative way of keeping information that was stored in their ledgers and file cabinets. They began setting up computer files of their own information.

Typically the accountant said to the programmer, "I need a file of accounts payable," and the programmer generated the software necessary to establish and organize that file. The warehouse manager said, "I need an inventory file," and the programmer would create those programs too.

For each file created, additional programs had to be written to accomplish the various searches and reports required—because people in different departments wanted to look at their data in different ways. In large companies this diversity of requirements resulted in the creation of hundreds of files and thousands of programs to access these files. The situation became unmanageable and unmaintainable.

Programmers saw that information in one file often related to or duplicated information in another; they also saw that data commonly consisted of those structural elements we now call keys, fields, and records.

To increase efficiency, programmers created master programs that allowed many people to enter data into a common system, but at the same time allowed people to view that data in a variety of

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ways. These master programs were the first database management systems.

Although the term database management system has a fairly strict definition in the mainframe community, it is used rather loosely in the microcomputer world. Almost every microcomputer program that handles information input and retrieval refers to itself as a database management system.

To reduce the confusion, we've tried to organize those programs that claim to be database managers into logical categories. We will concentrate on off-the-shelf programs intended for the end user, which means we'll omit the whole category of hierarchical and network database systems. These are elaborate, expensive systems that require extensive setup and are designed for the use of programmers.

Please note that the category descriptions that follow are general; products in each group will have some attributes common to products in other groups as well as attributes that are unique within their own groups. Use our categories as guidelines only.

File Management Systems (FMS). These are the most fundamental of the database management systems and are usually easy to use. These programs store information in standalone files (files that don't share information with other files). With an FMS you may create as many of these files as you need—for mailing lists, recipes, inventories, employee statistics, or any other purpose—but you can't pass information from one file to another.

When you create a file with an FMS, you generally start by laying out an input screen. In other words, you specify *what* will appear *where* on the monitor when data is entered for storage in the file. You might, for example, want to have an address file arranged so that name, street address, city, and zip appear in three lines in the upper-left corner, while the upper-right corner holds the telephone number field and the bottom area of the screen is reserved for a large comments field. Because you control the screen layout, there's no confusion or uncertainty about what information belongs where when it's time to start entering data into the system.

Most FMS programs also allow you to specify what type of data will be stored in each field—that is, whether the information in a given field will be numeric, alphanumeric, dollars and cents, yes or no, a date, or some other data type. Some programs allow you to be more specific than others about the kind of data you'll put into each field. You also generally specify the maximum length of the information that will be entered into each field.

The input screen you create is generally also used for search and retrieval. You can examine information one record at a time or summon groups of records matching specified criteria. Report generators, either included in the program or offered as options, allow you to format reports (specifying, for example, which fields will be included in the report and in what order they'll appear), extract statistics, make arithmetic calculations based on values held in specified fields, and so on. Capabilities vary from program to program.

Many file managers let you create files that can also be used by word processors, spreadsheets, or graphics programs. You can use the FMS for easy data entry and then apply the facilities of the other programs to the same data.

FMS programs are generally not able to make global changes throughout a database. For example, if the Postal Service decreed that all five-digit zip codes should have four zeros appended to them, you'd probably have to change the zip codes one record at a time—even one field at a time, if you had more than one zip filed per record.

There are a good many FMS programs available for the IBM Personal Computer. Conspicuous examples include *TIM III, Easy-Filer, The Data Reporter, VisiFile, Creatabase, Data Base Manager, Data Factory,* and *DB Master.*

Free-Form File Managers. These programs save unstructured (hence free-form) screenfuls of information in a file. The screen of information, which can be thought of as an electronic index card, is the record. There aren't any fields as such (unless you consider each word a field), but you can specify any word in the record as a keyword for retrieval purposes. You can have many different keywords for each record, and in some programs you can fill more than one screen per record.

These programs are wonderful for creating files that may not maintain the same field structure from record to record—phone conversations, recipes, research notes, general information. You input data onto the screen, select the keywords (usually by means of a function key), and save the screen to disk; information is retrieved by any appropriate keyword. Because your data is essentially fieldless, of course, you can't generate reports based on selected fields, as you can with a structured FMS. On the other hand, most free-form FMS programs do allow you to produce reports that include only designated areas of the screen—the top six lines, for example.

The best known free-form FMS programs for the pc are *DataFax, VisiDex,* and *PFS.*

Program Generators. Program generators can be considered a subcategory of FMS programs. By themselves they're not database managers at all, but they give you the means of creating the high-level language code for your own specialized database program.

These tools are generally used for two different purposes. They can create multiple file management systems, each tailored to a specific purpose. In this way they're handy for the novice programmer who wants a little more control over such things as display format, the appearance of menus, and so on, than an ordinary FMS provides. Since the code generated by program generators is unprotected, they can serve an educational purpose as well.

Because program generators can quickly turn out things such as sorting routines or report-generation modules, they can also be a timesaver for experienced programmers who want to incorporate such modules into their programs.

Examples of program generators available for the pc are *The Programmer* and *The Creator.*

The Relational DBMS. These are the most powerful of the DBMS programs available for the microcomputer end user. Besides having most of the features of file management systems, they can also perform operations that affect entire databases with single commands. A relational DBMS would allow you, for example, to append four zeros to all your zip codes at once.

The relational DBMS is also distinguished by its ability to operate on more than one database at a time. Cut-and-paste commands allow you to create new files from information in separate existing files.

The *join* command allows you to create new records in a new file from those records within separate files that have a common key. For example, let's say you have one employee file whose records contain only the names, numbers, salaries, and job titles. And you have another file whose records contain only the addresses of the employees. Using the *join* command, you can create a single file that includes all this information.

The *project* feature of a relational DBMS is similar to *join,* but it also allows you to extract specified fields from those records within separate files that have some key in common. With *project* you could, for example, make a new file whose records included the name and number fields from one file and the city, state, and zip fields from a second file.

The two well-known relational database programs available for the pc are *dBase II* and *Condor 20.*

All-in-One Programs. These are programs that add traditional FMS information management capabilities—such as sorting, searching, and report generation—to a spreadsheet environment. Any part of the spreadsheet can be treated as a database; within this database, each spreadsheet cell is a field, and a row of such fields makes a record. All-in-one programs are not nearly as powerful as FMSs or relational DBMSs, but they provide some very useful tools to the spreadsheet user.

Currently the all-in-one market is dominated by two programs: *MBA* and *1-2-3*.

Making a Choice. The accompanying checklist will help you compare available data management packages. In addition to the considerations listed there, you might want to find out if the program you're interested in is a rewritten version of a program originally designed for a less sophisticated computer; and you may want to know if it takes advantage of the pc's function keys.

How will you know, even after reviewing the features list, whether the program you select is a real database management system? You probably won't. Most such programs for microcomputers fall into the gray area of being "more or less" a DBMS. Compare the features of several packages to find one that has the capabilities and ease of use you require.

Shopper's DBMS Checklist

Here is a starting point for comparing DBMS software. Add to this list any additional features you require.

Requirements/Capabilities/Limitations

Memory. What is the minimum amount of memory necessary to run the program? Can the program take advantage of additional memory?

Disk drives. Will the program use only floppy disks or can it use a hard disk? Will it support single- and double-sided drives? Can large files be continued onto additional disks?

Display. Does the program support the IBM monochrome and/or color display boards? Boards by other manufacturers?

File access. Can you use several files simultaneously or only one at a time?

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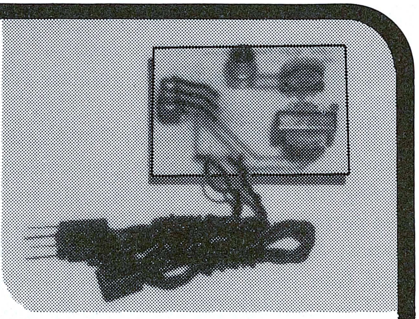

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Records per file. Is the number of records in a file limited, or is file size limited only by available disk space?

Fields per record. Is the number of data fields unlimited? (*dBase II* allows thirty-two fields per record.)

Field size. Is there a maximum size for any one field? Will you need to split a field into subfields?

General Features

Menu- command- program-driven. To use the program, do you select options from a menu, type English commands, or write programs? (*MAG/base* is menu-driven; *Condor* uses English-like commands; *dBase II* lets you type commands *or* set up programs called command files.)

Help. Is there a command for on-screen help while running the program, or do you have to use the manual?

Error reporting/handling. Will error messages mean your file is erased? Are you told how to recover from errors?

Data security. Can you password-protect data and functions? Are there multiple levels of passwords to allow different users access to specific information?

Data integrity. Will the program confirm that data entered is of the correct type and meets program specifications?

Data Field Definition.

Field names. Can you name a field ("zip code" instead of "field 1")? Is length of a field name limited?

Data types. What kinds of data can be stored in fields? Is a data field limited to alphanumeric characters? Examples of possible data types: character, numeric (integer and floating-point), logical (true/false), and date. Can you define your own data types (social security number, zip code, phone number)?

Calculated field. Does the program calculate fields in a record or only print calculations in reports?

Key field. Are single or multiple keys supported? Does the key have to be the first field in a record? Can your key include data from more than one field?

Restructure. Once defined, can you change a field's format, or add or delete fields? Or must you redo the entire database? (*dBase II*, for example, has a *modify structure* command.)

File Access

Access time. How much time is required to find the record you want? Worst case? Average case? Best case? Access time is a function of data structure and disk drive speed.

Multiple-record access. Will a single command affect one record or the entire database?

Multiple-file access. Can you access records in several files with a single command or must you access each file separately?

Multi-user. Can you limit access so other users can read, but not enter, file data?

Documentation

Does the manual have a table of contents?

Does the index, if there is one, list commands, error messages, and so forth?

Are words and phrases defined?

Does the program include a tutorial?

Does the manual illustrate sample display screens for reference during program use? Are sample applications included?

Is the manual written for your level of expertise?

Is there a quick-reference card?

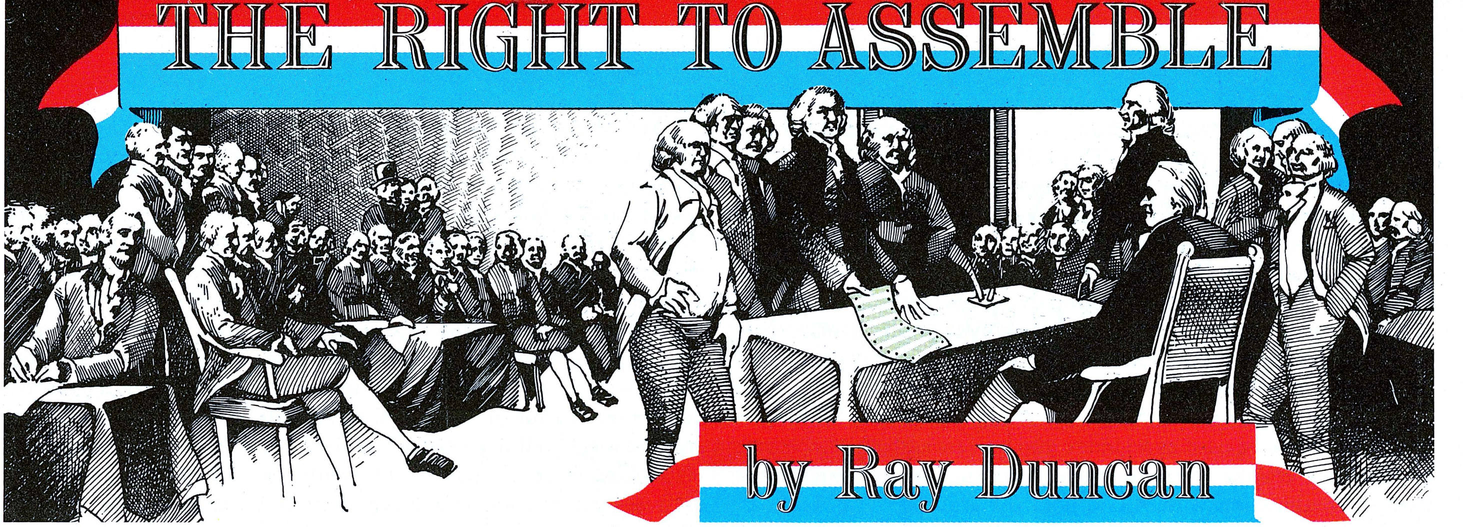
Other

Package contents. Are two copies of the program disk included if it is copy protected? Is there a binder for the manual? A pocket for the disk? Is there additional cost for updates or backup copies?

Support. If you have questions, do you call the dealer or the manufacturer? Does the manufacturer have a toll-free number? Is there a specified number of calls without charge? ▲

THE RIGHT TO ASSEMBLE

by Ray Duncan



Last month's installment discussed features common to the central processors of all computers and gave a preliminary overview of the Intel 8088, the microprocessor that's the heart of the pc. This month we'll begin looking at the 8088's anatomy in the detail needed for assembly language programming.

The Intel 8086, introduced in 1978, is a third-generation microprocessor with sixteen-bit architecture. The 8088, announced in 1979, is software compatible with the 8086 but has an eight-bit external data path, so that it can be used with the older, less expensive, eight-bit peripheral controller and memory chips. Since the 8088 can transfer data to and from memory only eight bits at a time, its performance is generally less impressive than that of the 8086. But it still gives from four to six times the throughput of the older microprocessors with eight-bit internal architecture—such as the 8080. In heavily byte oriented applications, the sophisticated internal features of the 8088, such as instruction pipelining, allow it to approach within 10 percent of the output of the 8086.

Although the 8086 and 8088 were entirely new machines electronically, their instruction sets are the result of compromises that attempted to combine the goals of compactness, execution speed, and upward compatibility with the previous generation of Intel microprocessors. The 8086/88 registers and instruction repertoire are a logical superset of those present in the 8080, and 8080 assembly language source programs can be run through a mechanical translator to produce new source programs that may be assembled and run on the 8086 or 8088 (although the actual binary machine instructions are completely different). Programs converted in this way, however, usually run relatively slowly and require extensive hand optimization to exploit properly the sixteen-bit features of the new processor.

The designers' objectives—upward compatibility and compact machine code—led to certain "features" of the 8086/88 instruction set that make it rather difficult to learn at the assembly language level. Some of the more powerful instructions require their arguments to be in specific registers, rather than taking them from any register that happens to be convenient to the programmer. Even ordinary instructions are often "weighted" in favor of a specific register, so that they'll generate a shorter op code or execute faster if a particular register is used.

Although the address space of the 8086/88 microprocessor is one megabyte, addresses as seen by the programmer are still only sixteen bits long, just as they were in the eight-bit processors. Access to the entire memory space is obtained by a relatively complicated procedure involving the combination of a base or *segment* register with an offset obtained from the currently executed instruction or from another register. There are only four segment registers, so that a program can "reach" at most 256K at any given time.

Consequently, we say that the architecture of the 8086/88 is "asymmetric," meaning that the address space is segmented, that many instructions will not operate on all registers, and that nearly every register has some special function in addition to its general uses. This is in contrast to the other major sixteen-bit microprocessor, the Motorola 68000.

The 68000 designers, having decided to throw out all hope of compatibility with their older machines, created a totally new computer with thirty-two-bit registers and an almost completely symmetric architecture, one for which the address space is "flat"; every location in memory is accessible to the 68000 programmer at any time, all the working registers are truly general in purpose, and any instruction can operate on every register. This elegant architecture is highly attractive to both engineers and system programmers, but the total break with previous micros has delayed the emergence of operating systems and mass-market application software for the 68000.

CPU Registers. The 8088 has eight semi-general-purpose registers, four segment registers that are used to form memory addresses, an instruction pointer, and a flags register whose bits signify results of comparisons and other logical operations. All registers are sixteen bits wide. The registers are shown in figure 1.

The general-purpose registers are subdivided into four data registers and four pointer/index registers. All the general registers can be used in most arithmetic and logical operations on data and are analogous to the accumulator on an eight-bit micro. Each of the

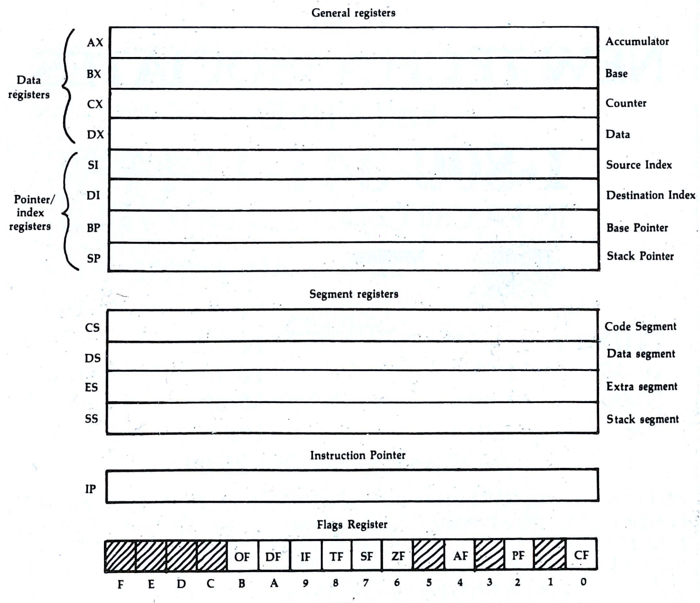


Figure 1.
General and special-purpose registers of the Intel 8088 microprocessor.

four sixteen-bit data registers, however, can also be subdivided and used as two eight-bit registers. This subdivision simplifies translation of eight-bit code. The pointer/index registers can only be used for sixteen-bit operations, but they also have important special functions in stack and string addressing.

As was mentioned before, some of the special instructions of the 8088 use certain registers implicitly. This reduces the programmer's options but allows for more brevity in the construction of binary machine instructions. Among the data register group, AX or one of its half-registers is used in multiply, divide, data port input/output, decimal arithmetic, and string translation. BX has the special ability to be used as an index into buffers and tables. CX participates as a counter in shifts, rotates, and loop control. And DX is used in combination with AX to hold the arguments or results of word-oriented multiply and divide instructions.

In the pointer/index register group, the SP and BP registers are used to address push-down or "last in first out" data stacks. SP is the true stack pointer and is used in *push* and *pop* operations. But BP can also access the same area of memory and is designed to be used as a "frame pointer" for high-level, procedure-oriented languages.

The stack is sixteen bits wide and grows downward in memory. That is, when data is pushed onto the stack, the stack pointer is decremented and the data is copied to the resultant memory address. When data is popped off the stack, it's copied to a register from the memory address currently indicated by the Stack Pointer, and then SP is incremented by two. Although it's common to talk of pushing data onto a stack, the data already on the stack never moves; what changes is the address held by the Stack Pointer.

The SI and DI registers (short for Source Index and Destination Index) may be employed for general arithmetic operations but are especially important in string operations. All the 8088's powerful instructions to initialize, move, compare, and translate strings take their addresses from SI and DI; they also automatically increment or decrement the index registers—depending on the status of the 8088's Direction Flag, which may be set under program control.

Segment Registers. From a program's point of view, the memory space of the 8088 is subdivided into 64K segments, and the segment registers are used as base pointers for simultaneous access to a maximum of four of these 64K areas. The value held in a segment register is multiplied by sixteen (shifted left four bits) and added to a sixteen-bit offset to form a full twenty-bit address; this twenty-bit address can specify any location in the one-megabyte memory space.

The code segment (CS) register points to the bottom of the memory area containing the currently running program code. This is used in conjunction with the instruction pointer register to form the actual physical address of the current machine instruction.

The data segment (DS) register is used in combination with offsets or the contents of registers to form the memory address of data items, such as program variables and constants. DS is also merged with SI in string instructions to form the full address of the source string.

The extra segment (ES) register is mainly used with DI in string instructions to specify the address of the destination string, but it may also be used freely by the programmer to access data anywhere in the 8088's memory space.

Finally, the stack segment (SS) register is employed with SP and BP to access the contents of the data stack.

The Instruction Pointer. The sixteen-bit instruction pointer (IP) is similar to the program counter (PC) on the 8080, except that it specifies an offset from the base address in the code segment register, rather than from the bottom of memory. Programs cannot load values into IP directly, but they cause its contents to be changed or saved on the stack by means of conditional or unconditional jumps, subroutine calls, or returns from subroutine instructions.

The Flags Register. The flags register contains three processor control flags that are set under program control; these flags influence the operation of instructions. The state of the direction flag (DF) determines whether string operations will proceed from lower memory to higher memory or in the reverse direction. The interrupt-enable flag (IF) allows or prohibits the computer from recognizing external interrupt requests. The trap flag (TF) is used by program-development tools to put the processor into a single-step mode.

In addition to these program-controllable flags, the flags register also contains six flags that are set automatically by the computer to signify the results of arithmetic or logical operations on data. These are the carry, auxiliary carry, parity, zero, sign, and overflow flags.

The carry and auxiliary carry flags (CF and AF) are set (hold a 1) if there has been a carry or a borrow during binary or decimal arithmetic operations respectively. The overflow flag (OF) is set if the destination of an arithmetic operation was too small to hold the actual result; this would imply the loss of significant digits. The sign flag (SF) is set when the result of an operation is negative and is cleared (holds a 0) when the operation's result is positive; the zero flag (ZF) is set when a result is zero. The parity flag (PF) is set when a result has an even number of 1 bits; this flag is used mainly for error checking in data transmission over a serial interface.

Each of the control status flags will be covered again in more detail when we discuss the various machine instruction groups.

Next month: interrupts, input/out, and more on memory addressing. ▲

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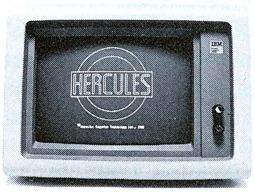

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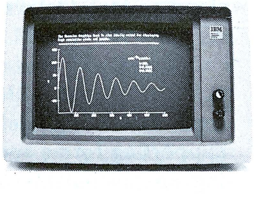

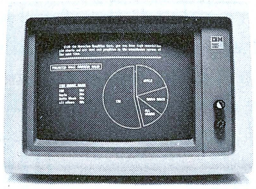

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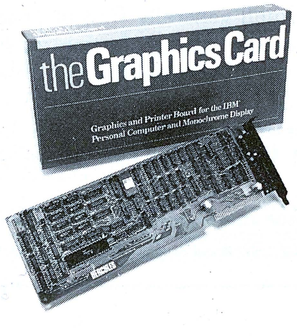
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THE FLOPPY TAX CONSULTANT

or

HOW TO SAVE A BUCK AT TAX TIME

by Allan Tommervik

When you are eleven packages into an overview of tax application software available for the IBM Personal Computer, subjective considerations start overpowering more objective standards. Every package does the calculations correctly, so it seems to boil down to panache and price.

Panache, read that bells and whistles if you like, is most certainly subjective. Price would appear less so, but the different publishers' approaches vary so greatly that even price becomes a subjective criterion, rather than the foundation upon which to make a choice.

Oddly enough, however, the most striking impression has nothing to do with taxes. It has to do, instead, with microcomputer history. Every phase of microcomputing software is represented here under the umbrella of tax applications software. You can find the primitive but promising programmer, the value-added programmer who ties onto existing code and concepts, the pragmatic programmer who is concerned as much with portability as with performance, and the performance-oriented programmer. You can find the CP/M approach, the Apple approach, the IBM Personal Computer approach, the p-System approach, all brought together on one machine at one time. The contrasts were discernible.

The CP/M and p-System approaches both conceded performance to gain portability. In the CP/M marketplace, that meant depending heavily on disk access. As little data as possible is kept in memory. As soon as practicable, calculations are fired off to disk to await recall when needed later. In an environment that featured nearly as many memory configurations as units, that was the safe and practical way to write software. In the pc, that approach isn't necessary. Just put L$ on the data bus and it'll reliably find all its homes.

In tax packages, there's more than the usual amount of storing to disk anyway as various schedules are completed; therefore, performance differences between the CP/M approach to data handling and the contemporary pc approach are not great. But it's quite an experience to be transported back to the days when the disk drive would wheeze and moan and grind and groan for seconds before achieving a bottom line.

With the p-System, there's some of the disk access, although substantially minimized. Instead, you feel the slightest hesitation of the machine before the bottom line arrives. As usual with good Pascal programs, the screens are cleaner and the screen prompts more helpful than you'll generally find in programs developed in other languages, although that distinction is blurring rapidly.

The Apple approach has the tight, performance-oriented code necessary to cope with a 48K memory limitation. It features mixes of Basic and assembly language. Screen design is advanced, but not overly helpful. For the most part, the pc's special function keys are ignored.

The contemporary pc approach maximizes the machine's features. Function keys are used appropriately and extra memory, sometimes as much as 128K, is employed. Screens tend to be clean and communicative.

Enough of these digressions. What we're talking about here is the annual masochistic rite of taxpaying and whether to use the pc to calculate, prepare, or plan our tax liabilities.

In the March issue, we looked at four packages directly aimed at tax calculation and preparation. We alleged that the division was a natural one—personal tax preparation packages in March, with tax planning and professional tax preparation packages to follow this month. That's not exactly how it worked. Two more personal tax preparation packages arrived. In addition, two of the tax planning packages are as suitable, or more so, as preparation packages. So, the final count in the great *Softalk* tax review marathon is eight packages worthy of consideration as tax preparers, one professional tax preparation package, and two professional tax planning packages. Such categorization ignores distinctions and shadings that we'll attempt to disclose as we go.

The arrival of additional personal tax packages has altered our course. Rather than treating the seven remaining packages exclusively, to keep everything on a reasonably even footing, we'll start by summarizing the attributes of the four titles discussed last month.

Those contenders were:

1982 VisiCalc Tax Preparation Models, Pansophics. This is a bareboned *VisiCalc* template that offers Form 1040 and Schedule A. You plug in the numbers and *VisiCalc* does the rest. Also available for *SuperCalc*. A good, simple tax calculation program. Terse documentation directed toward helping the user run the package; no tax advice included. Requires 64K. $100.

TaxCalc, Precision Financial Systems. This is a full-fledged *VisiCalc* template that includes Form 1040 and several of the most common supporting forms and schedules. The fleshed out model makes the program suitable for relatively simple forms of tax planning as well as tax calculations. Strong documentation on use of the program, but no tax advice. Requires 128K. $100.

The Tax Manager, Micro Lab. This one's a full-bodied personal tax management system. It includes nearly every supporting form and schedule known to man or the IRS. It will ask you questions to determine which additional forms and schedules you need. *Tax Manager*'s underlying diary system provides detailed documentation of deductions and makes it an excellent year-round tool for tracking transactions with tax ramifications. It is not a strong tax planning tool. Detailed documentation provides guidance on use of the program as well as information useful in tax preparation. Requires 64K and two disk drives. $250.

TaxCut, United Micro Systems. This is another powerful personal tax management system. It contains all the commonly used supporting forms and schedules. *TaxCut* is more ambitious in taking on calculations for itself and carries off the extra tasks with aplomb. Users can avail themselves of the ancillary forms for keeping tax diaries, but *TaxCut* is not a strong tax planning tool. Its manual is brilliantly clear in both the areas of program operation and tax advice. In addition, the manual is cross-referenced to various IRS publications that clarify tax issues. Requires 128K and one double-sided drive. $250.

This month's contenders, in the order we'll consider them, are *Personal Tax Planner*, *Tax Relief*, *Tax Preparer*, *TaxMode*, *Micro-Tax*, and *Professional Tax Plan*.

Personal Tax Planner, Electronic Data Systems. This package was something of a surprise. It isn't a total tax planner or a full-fledged tax preparer. What it really is best suited for is tax calculating.

As a tax calculator, it has a simplicity of design and directness of purpose that can be helpful to taxpayers who don't need sophisticated tax guidance. The *Personal Tax Planner* package includes several worksheets to guide the taxpayer. Unlike its more ambitious competitors, *PTP* has paper worksheets rather than electronic. Still, they direct the taxpayer's attention to potentially profitable details.

On the screen, the program's clear and understandable prompts elicit sufficient information to give the taxpayer the bottom line. The data can be saved to disk, then recalled and played with to explore alternatives.

The brief and direct manual matches the program's simplicity, guiding you through the prompts and occasionally offering a word of advice.

As a calculator of taxes, this one is smooth and efficient. It isn't a real tax preparer because it doesn't prepare the Form 1040 or supporting documentation. And it doesn't rate as a real tax planner because it can't plan past the 1982 results.

But at $49.95, *Personal Tax Planner* earns its keep by focusing clearly and simply on the most common tax issues. In addition, if you're due for a refund, the program breaks into song: "You're in the Money." That's not exactly what's meant when pundits call for using all the capacities of the microcomputer. On the other hand, it lightens up a heavy computing session and makes you wonder why the $250 packages aren't rendering "Rhapsody in Blue."

Tax Relief (Module III), by Micro Vision. *Tax Relief* will strike a nostalgic chord in the hearts of veteran microcomputer users. It's a first effort by a new company and, like many early application programs on the Apple and TRS-80, it lacks as much sophistication as *TaxCut* has.

Screen displays range from ordinary to confusing and include typographical errors that tend to lower a user's esteem for and confidence in the program. The program itself breaks data entry into two separate modules—data entry and edit/review. Correcting typographical errors in the data entry format is impossible once you've passed the screen by, and once you've been in a section of the program for data entry, you're locked out for that purpose. It's necessary to enter the edit/review module to get back to the point of error and make corrections.

Tax Relief treats only some of the common supporting schedules and forms electronically. For the rest, you'll need a sharp pencil and some scratch paper.

If you're now wondering what a Plain Jane like *Tax Relief* is doing running around in the company of spiffy software like *TaxCut*, it's not all that irrational. The program does exactly what it sets out to do: accurately calculate and prepare your Form 1040, schedules A, B, C, D, E, F, G, R, RP, SE, and W, and Forms 2441 and 6521. That leaves some significant holes, such as Form 2106, which itemizes unreimbursed business expenses. But if your requirements match Micro Vision's choices, you can get into the product for $129.95. That's a reasonable price for the value.

Micro Vision represents a different segment of the industry than is generally seen in the IBM pc marketplace—the small entrepreneur attempting to bring an applications product to market without the six- or seven-figure dollars usually considered necessary to market successfully in this environment. You don't get bells and whistles when you buy *Tax Relief*, but you don't pay for Madison Avenue and four-color packaging either. As the man said, "You pays your money and you takes your choice."

Tax Preparer, HowardSoft. *Tax Preparer* has been the Apple's most successful tax preparation package. On the pc, it's a winner that'll prepare anything you want except pepperoni pizza.

Tax Preparer is priced and provides service comparable to *Tax Manager* and *TaxCut*. It'll do supporting forms and schedules until you're numb from entering the data. In addition to supporting the plethora of IRS documents, HowardSoft provides a facility they call the "general itemizer." It's a dandy means of documenting taxable transactions and provides the same kind of diary facility contained in the Micro Lab package.

HowardSoft's report module is the only one besides *TaxCut* that tracks which forms and schedules you've used and automatically prints them. That's a nice feature, both for home users up to their elbows in paper and for professional tax preparers, who should be able to depend on software to do their "remembering" for them.

The manual for *Tax Preparer* is a thoroughly professional production, providing detailed guidance on how to maximize use of the program. It abstains from providing any sort of tax guidance. It also gets a loud raspberry for combining instructions for the Apple and IBM versions under one cover. That might be acceptable for XYZ Fly-by-Night, Inc. charging $30 for their first-ever product. But it's tacky from an industry leader asking $250. For that kind of bread, we could be spared the knowledge of how to boot an Apple.

But that's a minor indiscretion for an otherwise outstanding product. *Tax Preparer* is a clean and efficient preparer of tax returns and a useful tool for tracking items that have tax consequences through the year. What might be termed the "static cursor" also makes *Tax Preparer* a little more viable than its counterparts for planning purposes, although the program makes no pretensions in that regard.

The static cursor is annoying until its more subtle use is recog-

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nized. What happens is that after you enter, the cursor returns to the beginning of the same line and, waits for you to approve the entry by striking enter a second time. That's a holdup if you're trying to do power data entry; but if you're toying with varying options, having that cursor sit there while you throw in several alternatives to observe the consequences is a real boon. That alone does not a tax planning package make, in the sense that the package is not equipped to cope with future years. But it'll play what-if with this year's results more facilely than the other preparation packages.

TaxMode, Sawhney Software. This program aims at the tax planning market, which means that it's generally directed to the tax professional. Most tax planning is far too sophisticated a process to try to do at home with your pc. If you already understand the tax consequences of buying a 30 percent partnership in a 300-unit apartment building by paying $50,000 down and obtaining a letter-of-credit for $200,000, you are a tax professional and not Joe Taxpayer.

Nevertheless, *TaxMode* deserves some attention by the individual buyer of a tax package. The manual only gives instruction on program operation, not on tax consequences, but the program itself will calculate your taxes in jig time if you come to the task well prepared. That's not why *TaxMode* exists, but it might be a good choice for the individual who wants to dabble in tax planning as well as get computer assistance in calculating Form 1040.

In general, tax planners can be identified by their ability to work ten years in advance of the present, using present tax laws as they work now and as they've been enacted to take effect in future years. Thus, a good tax planner, such as *TaxMode*, will take tax indexing into account for the years following 1985 until such time as our good friends on Capitol Hill repeal it.

TaxMode approaches tax planning in an interesting fashion. Once you've installed a base case, you can change up to ten variables at a time. A window allows you to track either the effects of individual changes or the cumulative effect of all the changes. It's a fascinating experience to watch your tax liability change as you propose different courses of action. You can plot up to three alternatives before saving to disk and proceeding.

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Two interesting fillips in the package are that *TaxMode* will show you how much of your medical deductions are not allowable and will extrapolate anticipated effects of state income tax laws.

The *TaxMode* program is a pleasure to use and should be a valuable addition to many individual software libraries. If it has a drawback, it's that its reports are limited. And it must compete for the tax professional's attention with the Aardvark package.

Micro-Tax (Level II), Microcomputer Taxsystems. *Micro-Tax* is a thoroughly professional tax preparation system aimed at the thoroughly professional tax accountant. It's the CP/M translation that'll make your floppy disks work overtime; but that problem is alleviated with the use of the hard disk, the only way such a superior program should be treated.

Micro-Tax comes at $1,000 a pop—not your normal fare for a home user. Wanting to do your personal return on *Micro-Tax* is rather like insisting on driving your Rolls Royce to the corner liquor store for a six-pack. You can, but what a waste!

Everything about *Micro-Tax* exudes knowledge and concern for the professional preparer's needs. To begin with, the package will print out questionnaires designed to elicit all the data needed for filling out any of the supporting forms and schedules that a taxpayer may need. These questionnaires are so numbered that power data entry becomes a true possibility on a microcomputer in a high-volume tax office.

Of course, power data entry carries with it the risk of costly typographical errors. As an ounce of protection, this program has a checksum provision, which stops data entry if the questionnaire's checksum doesn't match the one calculated by the computer. Because you literally cannot continue until the difference is reconciled, spurious entries cannot be accepted.

The power data entry concept is further enhanced by the program's batch processing capability. A tax consultant can spend all day using the pc to print out questionnaires and keyboard the results. Then the data can be batched to the correct accounts during quieter hours. There is absolutely nothing else quite this powerful in sight of the pc-owning tax accountant.

That doesn't mean it's the package for every professional. *Tax Preparer*, *TaxCut*, or *Tax Manager* may be a better choice for a low-volume office. But as nifty as those packages are, they're no match for *Micro-Tax* in a high-volume environment.

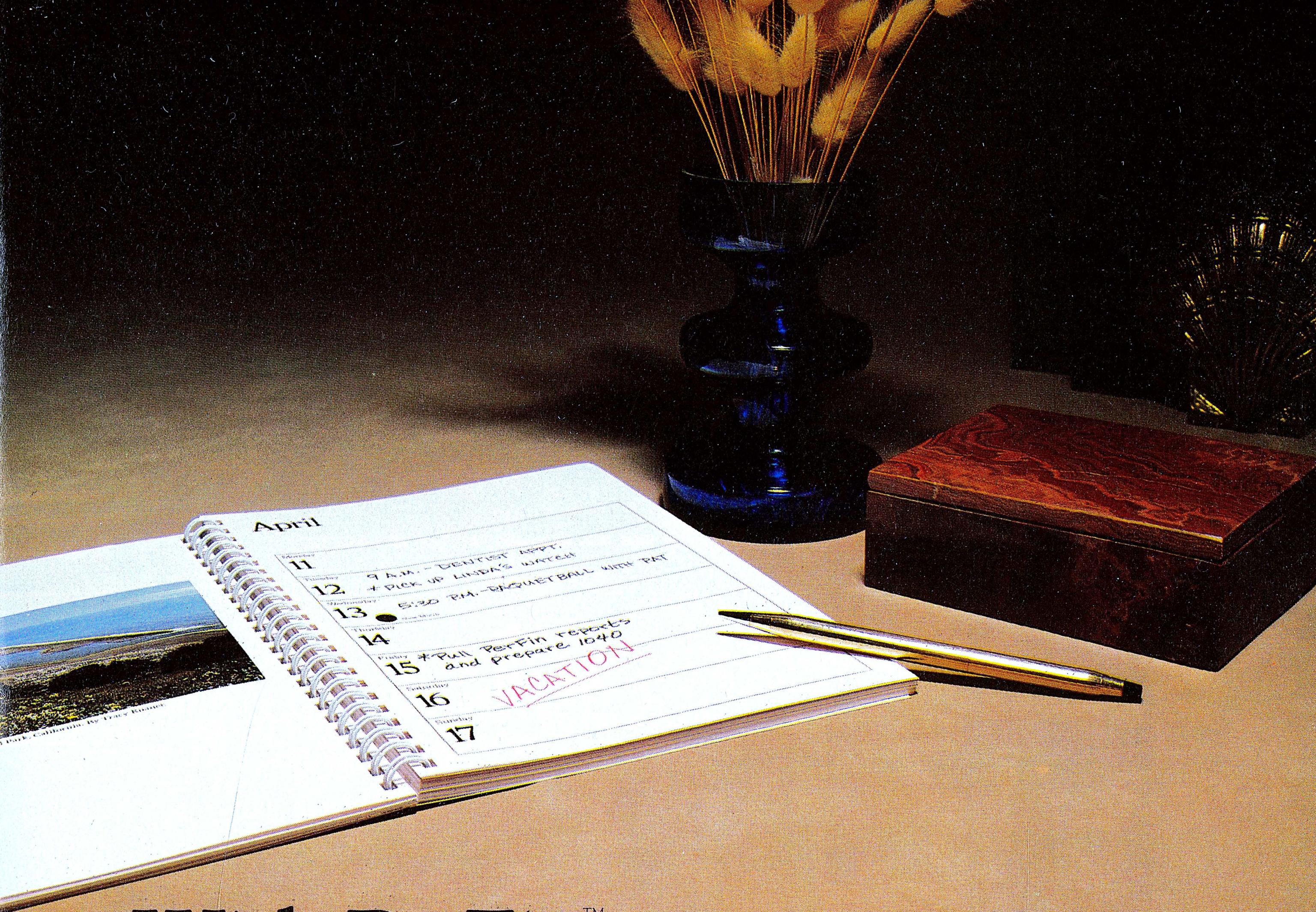
Professional Tax Plan, Aardvark Software. This is a package that's been around, because of its p-System portability. The folks at Aardvark have taken advantage of that longevity in the marketplace to fine-tune the software.

Professional Tax Plan is far more complete and versatile in planning than the other tax planners considered here. It'll do three alternatives at a time, save them off to disk, and do three more.

The program allows for better documentation of tax assumptions than the other planners and is more versatile and more complete in its reporting formats. As a tool for a tax consultant, it's nonpareil.

Professional Tax Plan has such nifty planning features as the ability to step a variable by a given percentage each year of the planning period. This is a real timesaver for factoring in such predictable variables as inflation. Aardvark went the whole nine yards on that feature, even allowing compound percentage increases to account for All-Saver's Certificates and other notes that accrue compound interest. That's just one measure of the care and thoughtfulness that went into this one.

It's not really a cost-effective tool for the casual user, but it's dynamite in the hands of a qualified tax professional. ▲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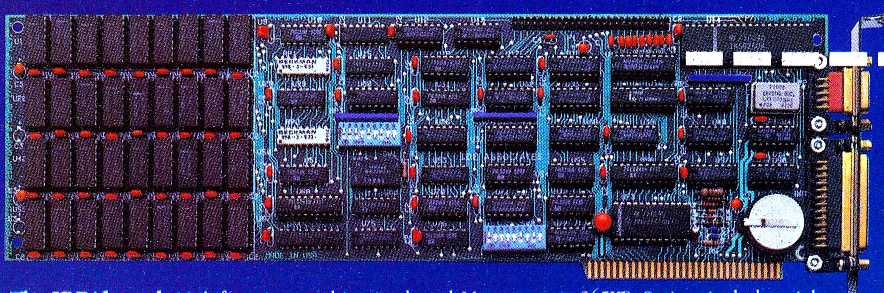

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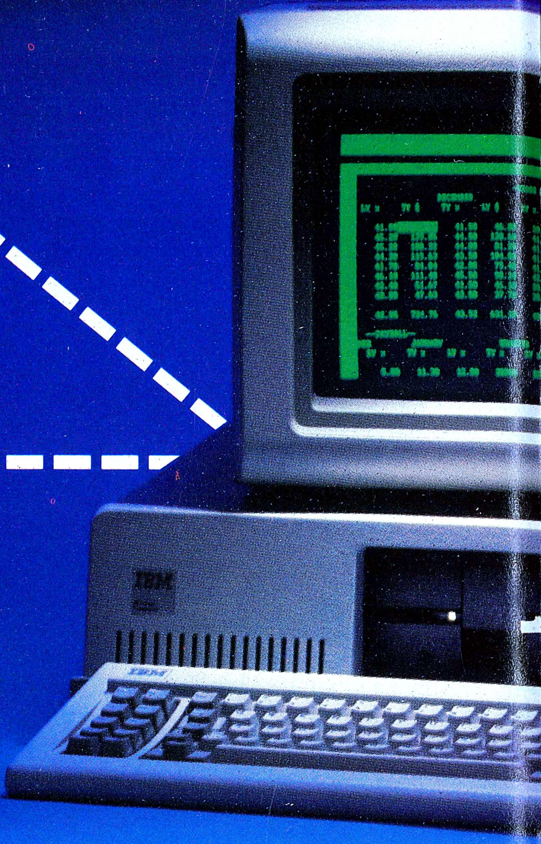

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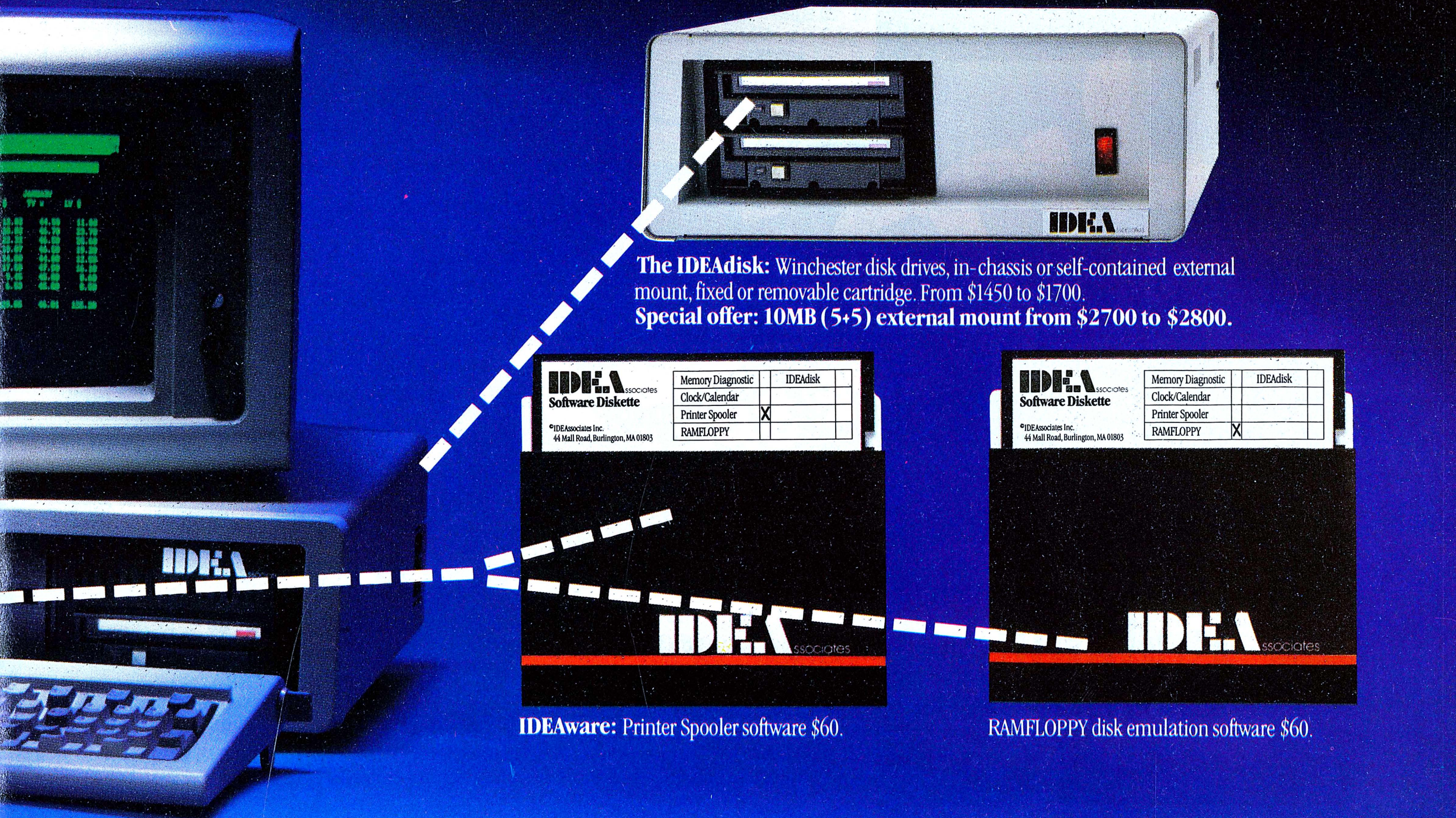
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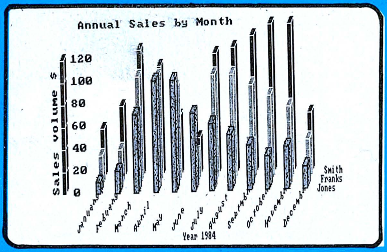

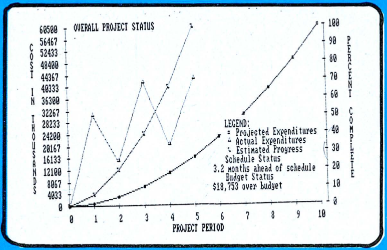

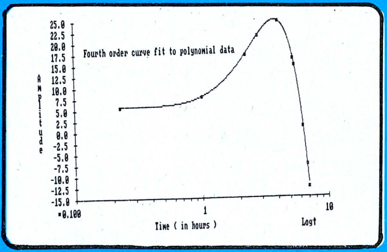

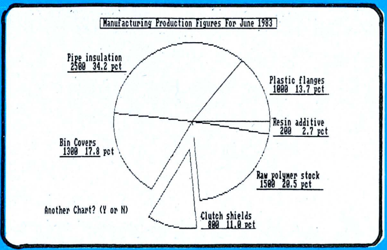

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JOBTRAX is a planning and monitoring tool for engineering, architectural and construction projects. Use **JOBTRAX** for CPM scheduling, manpower/resource planning and budget/schedule monitoring. Turn your columns of numbers into graphic reports that are quickly and easily understood!

Includes demonstration files and manual. Requires 128K and color graphics adapter. $325.

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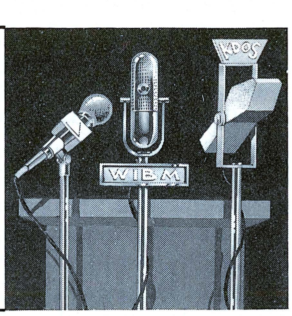

Unless otherwise indicated, software listed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

Δ *The Programmer's Journal* is a resource newsletter for professional pc programmers. First issue includes a conversation with Peter Norton, creating batch files in Pascal, software styling tips, a Basic tutorial, and an analysis of the language C. Published bimonthly by **Programmer's Journal** (2765 Potter Street, Eugene, OR 97405; 503-687-0398). $24 per year.

Δ Re-create the Battle of the Bulge in the war-game simulation *Tigers in the Snow*, from **Strategic Simulations** (465 Fairchild Drive, Suite 108, Mountain View, CA 94043; 415-964-1353). With forces on the division and regiment scale, the Allies hold out under the German onslaught. Infantry, artillery, and air power available to both sides; units have the ability to move through zones of control. Requires color/graphics adapter. $39.95. Δ *Epidemic!* is a Rapid Fire strategy game of Earth versus the alien microbes. As director of the Global Disease Control Center, you struggle to save the world. Requires color/graphics adapter. $39.95.

Δ **Generic Software** (Box 790, Marquette, MI 49855; 906-475-7151) makes *Depreciation-Master*. It allows you to maintain asset inventories and depreciation schedules by using screen forms to enter data; also provides twenty-seven standard ACRS depreciation schedules. Create files as large as your disk space allows. Requires two disk drives. $149.

Δ Conduct your own experiments in robotics with the RB5X Intelligent Robot, a robot starter system for home hobbyists, from **RB Robot** (14618 West Sixth Avenue, Suite 201, Golden, CO 80401; 303-279-5525). With its own microprocessor, memory, programs, and tactile sensors, it has the ability to remember its actions and correct its responses to situations. Compatible with the pc, the robot's memory can be transferred to a micro and studied, and new programs can be written. Additional mechanical functions and sensors can be added to the basic unit. $1,195. Option package (with additional memory, sonar sensor, and pulsating light): $295.

Δ **Sierra On-Line** (Sierra On-Line Building, Coarsegold, CA 93614; 209-683-6858) has announced its first color graphic adventure for the pc: *Ulysses and the Golden Fleece*. Unseen danger, priceless treasure, brain-wracking puzzles, and fun are promised. Requires color/graphics adapter. $39.95.

Δ Build customized applications with *Info-Gen*, a record-management system and applications generator. Features include automatic editing, file definition, calculations, label formats, and more. $245. Δ Interfaces with *Info-Reporter*, a flexible report writer that uses multiple relational data files to produce reports. $125. Δ *Info-Sort* provides sorting of data records at a speed of one hundred per second. $95. All three from **LM Systems** (1340 East Katella Avenue, Anaheim, CA 92805; 714-937-1641).

Δ The PC Hanger, from **DLH** (Box 243, Moorhead, MN 56560; 218-233-1195), is an adjustable hardware device allowing the pc to be hung in a vertical position on the side of a desk. Made of heavy gauge steel with a textured, black enamel finish, the unit requires no modification to the computer. $79.95.

Δ **Computer Aided Design** (764 24th Avenue, San Francisco, CA 94121; 415-387-0263) has created *MicroCAD*, a 3-D design tool that allows you to plot up to four thousand points with only 64K. Objects may be constructed, rotated, appended, moved, viewed in perspective, and edited. Can also edit graphics, using a built-in spreadsheet, or take input from *VisiCalc* files and display hi-res graphs. Can be customized to work with light pen, mouse, joystick, or plotter. Requires two disk drives. $500.

Δ *Computerized Office Equipment Expo/Midwest '83* will be held April 5 through 7 at the O'Hare Exposition Center in Rosemont, Illinois. Over two hundred fifty displays of computerized and automated office equipment, information systems, and related services. Keynote speaker will be Dr. Leonard Liu, vice president of office systems and programmable work stations at IBM. Sponsored by **Cahners Exposition Group** (Cahners Plaza, 1350 East Touhy Avenue, Box 5060, Des Plaines, IL 60018; 312-299-9311).

Δ **Chang Laboratories** (5300 Stevens Creek Boulevard, Suite 200, San Jose, CA 95129; 408-246-8020) offers a concurrent word processing package called *MemoPlan* for the composition of memos, letters, and reports. Up to five documents are available at a time; split-screen feature makes it possible to work on two at once. Requires two disk drives. $195.

Δ **Money Tree Software** (550 S.W. Fifth Street, Corvallis, OR 97333; 503-757-1114) has updated its *Tax Planner*. The new version can now estimate state taxes as well as federal. $375.

Δ Income tax templates that work with *1-2-3* are available from **Professional Software Technology** (Whistlestop Mall, Box 269, Rockport, MA 01966; 617-546-2073). Personal tax package has single, head-of-house, joint, and separate tax return models. Forms 1040, 1120 (corporate planning), and 1065 (partnership planning) make up the professional tax package. 1040 schedules are prepared; print directly onto forms. Personal: $100. Professional: $175.

Δ Learn *VisiCalc* from a set of three ninety-minute instructional tapes that cover beginning commands, functions, and templating. Spoken in a conversational tone; example and exercise disk included. The *VisiCalc Audio Course* is from **Personal Tutor Associates** (Box 246, Clinton, MD 20735; 301-856-2280). Cassette player required. $95. Tapes only: $50.

Δ Hints and help on various PC-DOS commands are displayed in *PC/Help* from **Relational Solutions** (5857 South Gessner, Suite 103, Houston, TX 77036; 713-972-1800). $29.95.

Δ A relational database that's transportable to other types of computers in a network is available from **MicroRIM** (1750 112th Avenue N.E., Bellevue, WA 98004; 206-453-6017). *MicroRIM* provides column records and data formats and allows the combination of different tables of information. Standalone modules for query, database definition, and report generation. Optional program interface available. $595.

Δ *Micro/Scan* is an investment database service in software form, with 1,400 stocks, fifty-two variables per stock, and eighty-eight industries. Screen stocks, select to buy and sell, search and analyze acquisitions, analyze portfolios, and make reports. Published by **Isys** (Box 214, 50 Church Street, Cambridge, MA 02238; 617-491-6221). Variables updated monthly. $6,250 per year.

Δ The UCSD Pascal User's Society, **USUS** (Box 1148, La Jolla, CA 92038; 619-297-1101), will hold its semiannual national meeting at the Hanalei Hotel in San Diego, California, April 22 through 24.

The meeting will feature technical presentations, hardware and software demonstrations, language tutorials, special interest group meetings, and software library exchange. Nonmembers welcome. $25 for three days.

Δ Computer retailers can subscribe to a program for presale computer education and postsale training from **Computer Labs of America** (9340A Clairemont Mesa Boulevard, San Diego, CA 92123; 714-576-1133). Service includes video training tapes, self-contained training module housing the hardware, and free monthly tape. To be used with computer. $349 per month.

Δ **Blue Water Systems** (Box 1877, Oceanside, CA 92054; 619-722-0059) is marketing *Expandson*, an Epson printer enhancer for use with *WordStar*. Creates expanded and compressed letters, line graphics, foreign characters, and more. $39.

Δ The IBM-Z80 Concurrent Processor from **Innotech Digital Systems** (126 Shorting Road, Scarborough, Ontario, Canada M1S 3S6; 416-292-2012) gives you CP/M 2.2; provides a 64K buffer when you're working in DOS. Includes a real-time clock. Both the 8088 and the Z-80 run concurrently in a master/slave configuration. Includes necessary software. $579.

Δ *Terran Jeopardy* is a fast and furious arcade game that pits your skill against the Black Horde. The fate of the earth is in your hands. Requires color/graphics adapter. $29.95. Δ *Air Traffic Controller* puts you in control of all the incoming aircraft at a big metropolitan airport. Monitor planes on radar screen, direct runway approaches and landings, even handle an occasional hijacking or UFO. $29.95.

Δ A new graphics capability for the Oasis operating system that extends what is already built into Basic has been released by **Phase One Systems** (7700 Edgewater Drive, Suite 830, Oakland, CA 94621; 415-562-8085). Oasis-16 supports raster-scan, random-point graphic devices. The enhancement is free with the Oasis system.

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Patent Pending

Δ **CBS Educational and Professional Publishing** (383 Madison Avenue, New York, NY 10017; 800-227-1617) has a set of four new books designed to introduce and explain basic programming languages, machine functions, and user applications. *Your IBM Personal Computer: Basic and Applications* is intended to get the first-time user over the hurdle of introduction to the pc, using confidence-building text on programming concepts. *UCSD Pascal* emphasizes the syntax of the language and good programming design. *Basic* is an introduction to the programming language that can be used at home or in a classroom. *Fortran 77* has examples, problems, and exercises drawn from the sciences and engineering. More books to come in the series will focus on graphics, the UCSD p-System, *VisiCalc*, and the Macro Assembler. Each volume in the series is $16.95.

Δ A portable computer that's plug-in-compatible with the pc is marketed by **Colby Computer** (Number 2 Palo Alto Square, Palo Alto, CA 94304; 415-493-7788). The Colby PC-1 Conversion Kit allows pc users to transfer the capabilities of the pc into a twenty-six-pound portable unit. Included in the kit are a nine-inch hi-res display, a switching power supply, a wiring harness, and interface boards, all housed in a sturdy case. Conversion can be made in less than an hour. $899.

Δ An inventory program for coin collectors, called *Coins*, is available from **Compu-Quote** (6914 Berquist Avenue, Canoga Park, CA 91307; 213-348-3662). Enter your collection and produce various printed reports for personal investment and tax purposes. Includes a value file of information and market prices on sixteen hundred coins, updated quarterly. Requires two disk drives. $95. Quarterly updates: $25.

Δ The **Osborne/McGraw-Hill** (2600 Tenth Street, Berkeley, CA 94710; 415-548-2805) catalog of computer books, spring 1983, is now available. The twenty-page, full-color brochure contains over sixty publications under the categories of general interest, programming handbooks, assembly language and technical reference guides, user guides, and disk guides. Two new titles: *Your IBM PC*, *VisiCalc Made Easy*. Catalog is free.

Δ Three new games from **Mirror Images Software** (1223 Peoples Avenue, Troy, NY 12180; 518-274-2335): the arcade game *Spyder* puts you in a cave, armed with a laser, defending yourself from spiders attacking from above. Animated scissors add to the challenge. $39.95. Δ Another arcader, *Tachyon*, puts you in command of a star cruiser, traveling through the galaxy, seeking out hostile forces. Enemy ships must be destroyed before you run out of energy. $39.95. Δ *Hide and Sink* is a strategy game of the high seas. Pit your naval fleet against the computer's fleet on a ten-by-ten sea grid. $29.95. All three games require color/graphics adapter.

Δ **Funtastic** (5-12 Wilde Avenue, Drexel Hill, PA 19026; 215-622-5716) has just released *Cosmic Crusader*. The arcade game immerses you in the fray of the battle to save the earth. Requires color/graphics adapter. $38.95.

Δ *Dial-Out* is a monthly newsletter covering the microcomputer telecommunications field exclusively, including national networks, local area services, and bulletin boards. First issue features user's map of the new Delphi time-sharing network. Published by **Dial-Out** (175 Fifth Avenue, Suite 3371, New York, NY 10010; 201-653-5775). $25 per year.

Δ Color-coordinated index tabs for your pc manuals are available from **ATC Software** (Route 2, Box 448, Estill Springs, TN 37330; 205-837-4718). $7.95 per manual.

Δ *Hercules* is a vehicle maintenance and reporting package that keeps track of and compares fuel, oil, and repair costs; schedules preventive maintenance; and provides a variety of analytic comparison and management reports. From **Computer Task Group** (800 Delaware Avenue, Buffalo, NY 14209; 716-882-8000), the package is most useful for fleets of five or more vehicles. $1,995.

Δ **Raging Bear Productions** (21 Tamal Vista Drive, Suite 175, Corte Madera, CA 94925; 415-924-1194) has announced the National Software Show, a trade show for all operating systems, to be held October 19 through 21 at the Trade Show Center in San Francisco, California. Seminars and conferences will complement the software focus of more than five hundred exhibits.

Δ An intelligent terminal and transfer program for communicating with other computers, *Direct.Connect* captures data to a disk file and/or printer and sends files. From **Direct.Aid** (395-C South Broadway, Boulder, CO 80303; 303-494-8265), the program features programmable function keys, changeable parameters, a serial interface option, and up to 9,600 baud. Requires 96K, RS-232C serial interface, eighty-column monitor. $145.

Δ *The Chrome Ranger* is a fast-action arcade game from **Omniware** (8972 East Hampden Avenue, Box 32, Denver, CO 80231) with selectable skill levels, maze layouts that change as the game progresses, and a joystick option. Either monitor. $29.95.

Δ A line of continuous fan-fold checks and accessories for home or small business use is made by **Synergistic Solutions** (4715 Shepherd Road, Mulberry, FL 33860; 813-646-6557). Three to a page, the forms can be used on any tractor, pin, or friction feed printer. Suited for both manual and batch use; software included. Two-hundred check package: $59.95; 500-check package: $79.95.

Δ The *Tax Mini-Miser* is a comprehensive tax-planning tool for accountants, stockbrokers, investment counselors, lawyers, and individuals with higher incomes. The package comes from **Sunrise Software** (36 Palm Court, Menlo Park, CA 94025; 415-441-2351) and computes and compares the tax consequences of alternative tax strategies, projecting taxes into the future. Special version for California income-tax computation; other states planned. Updated annually. $295.

Δ A 2.0 revision of the arcade game *Podlaserium* includes the ability to fire multiple shots, the addition of menacing alien raider ships, and an even more deadly pod missile. All courtesy of **DP Computer Services** (5019 North Washington Boulevard, Arlington, VA 22205; 703-276-1333). Fifty dollars will be given to the first person to score more than 49,999 and $100 to the first to top 99,999 in the new version of the game. $34.95.

Δ The apples will get you if you don't watch out when playing *Apple Panic*, an arcade classic from **Broderbund Software** (1938 Fourth Street, San Rafael, CA 94901; 415-456-6424). Flee from little apples chasing you through a multilevel mansion, dig holes to trap them, and beware the green butterfly. $34.95.

Δ **Trax** (8948 West 24th Street, Los Angeles, CA 90034; 213-670-9699) has announced an Apple/pc software interface, called *Direct Connect*, that transfers files and supports communication using the standard hardware supplied with each machine. Uses the cassette port on the pc; no adapter or hardware required. Pascal interface included. $170.

Δ A self-contained system providing index sequential file access directly from Fortran application programs, *Fortran Index Sequential Access Method* (FISAM), has been released by **CTI** (1222 Dauphin Avenue, Wyoming, PA 19610; 215-378-9492). Program is based on automatic assignment of keys to each record added to a file. Password facility included. $400.

Δ Four modules that manage all aspects of data entry, manipulation, and retrieval make up *DataEasy*, a database-management system from **Data Consulting Group** (877 Bounty Drive, Suite EE203, Foster City, CA 94404; 415-349-4001). Labels and reports can be made with *EZ-Datalabel* and *EZ-Reportaid* modules. Requires two double-sided disk drives. $350.

Δ **Owl Software** (6927 Atoll Avenue, North Hollywood, CA 91605; 213-982-6243) has announced the release C2.0 of its 128K *Textplus* text processor. New version is faster, contains in-memory print spooler, allows for larger files, and more. $240.

Δ Three new strategy games and a word game from **Epyx/Automated Simulations** (1043 Kiel Court, Sunnyvale, CA 94086; 408-745-0700): *Star Warrior* pits a lone planetary avenger against an occupation force of storm troopers and military vehicles. Walk, jump, and fly through two scenarios with nineteen command options and five skill levels. Requires Advanced Basic and color/graphics adapter. $39.95. Δ *Oil Barons* is a strategy game that takes the player into the high-stakes world of the international oil market, where wheeling and dealing to be the kingpin of the world energy market is the name of the game. Game board included. $100. Δ *Crush, Crumble, and Chomp!* is a movie-monster strategy game. You assume the role of any of six man-eating creatures in over one hundred possible scenarios to wreak havoc on four major cities. Requires Advanced Basic and color/graphics adapter. $29.95. Δ *Jabbertalky* is a programmable word game for one or more players that includes an anagram game and a code-breaking game, plus a utility to create free verse and other random fun. $29.95.

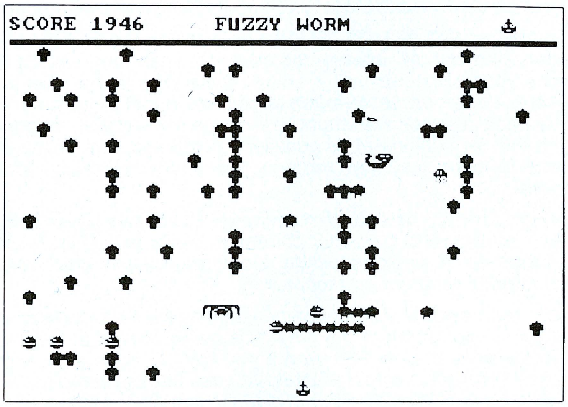
Δ *Blingsplatz!* is a real-time arcade game that puts you far out in space, defending an outpost by firing missiles at your attackers. From **Omric** (258 Tower Hill Road, Box 309, Chaplin, CT 06235; 203-455-0492). $34.95.

Δ A five-program Basic utility package, *Basic Programming Tools*, includes a full screen editor, automatic conversion of symbolic line labels to line numbers, listing with cross references, and more, is available from **Synergistic Software** (830 North Riverside Drive, Renton, WA 98055; 206-226-3216). $120.

Δ All PC Modem Plus systems, by **Ven-Tel** (2342 Walsh Avenue, Santa Clara, CA 95051; 408-727-5721), now include *Crosstalk*, a communications package that links you to other *Crosstalk*-compatible mainframes, minis, or other micros. $389.

Δ Bank security officers and auditing personnel can now use *Loss Control* and *Audit Control* to spot trends and focus on the losses in their jobs. From **Quest Designs** (371 22nd Street, Oakland, CA

FUZZY WORM $29.95



FUZZY WORM is an absolute must for everyone who enjoys fast action arcade games. The object of the game is to destroy all of the FUZZY WORMS while avoiding the DROPPERS and the deadly SPIDER. Bonus points can be earned by shooting the FIREBALLS which occasionally make their way onto the screen.

The game is loaded with features:
- Extra SHOOTERS are awarded for high scores.,
- The sounds are fantastic and can be turned ON/OFF during the game.
- The TOP 10 scores are saved on the disk.
- Each succeeding level gets faster and more challenging.
- Works with all displays: Monochrome, TV, B&W, Color, RGB.
- Requires an IBM-PC with at least 64K memory and 1 disk drive.

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94612; 415-839-1579), the software tracks and analyzes bank losses and recoveries by operating unit and category. Loss history can be traced using thirteen different search criteria. $750 each.

Δ **Norell Data Systems** (3400 Wilshire Boulevard, Box 70127, Los Angeles, CA 90010; 213-257-2026) has announced a game of chase for the mono adapter and display called *Munchkin*. Zip though the maze without getting eaten by the baddies; energizing dots turn the tables on them. $24.95.

Δ The real estate program, *Property Management*, from **Continental Software** (11661 San Vicente, Suite 903, Los Angeles, CA 90049; 213-820-2606) performs all the bookkeeping functions for any residential or commercial property with as many as one thousand renters or lessors, depending on hardware. Financial records, including income and expense summaries, and individual tenant records can be generated. $695.

Δ **Profit Systems** (Box 1039, Berkley, MI 48072; 313-559-0444) has introduced AddRAM Plus, a multifunction board providing two asynchronous communication adapters, real-time clock/calendar, and 64K expandable to 512K of memory. The memory supports IBM parity operation; the board is socketed for easy memory expansion. Available in one or two asynchronous port configurations. Software for clock and buffer operation included. $595.

Δ An estate-planning program for insurance and financial planning professionals is being marketed by **Michael D. Weinberg Consultants** (4025 South Oneida Street, Denver, CO 80237; 303-691-9813). *Mike Weinberg's Estate Projector* provides customized estate and tax projection printouts; covers each year of the client and spouse's life expectancy; incorporates variable inflation rate and present value projections, and selected percentage of marital deduction assumptions. $695.

Δ A technical tour to the Japan Microcomputer Show in Tokyo in late May will be sponsored by **Commerce Tours** (870 Market Street, Suite 740, San Francisco, CA 94102; 415-433-3072) and Japan Airlines. The show will feature more than one hundred Japanese microelectronic exhibitors. Last year, eighty thousand people attended the show, three thousand from other countries. The two-week tour will include visits to Taiwan and Hong Kong and seminars on how to do business in each country visited. Rates will vary depending on point of departure.

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Created at MIT in 1966, ELIZA has become the world's most celebrated artificial intelligence demonstration program. ELIZA turns your computer into a non-directive psychotherapist with whom you can converse much as you would with a live therapist. She analyzes each statement as you type it in and then responds with her own comment or question. Response time is virtually instantaneous, and her remarks are often amazingly appropriate!

Designed to run on a large mainframe, ELIZA has never before been available to personal computer users except in greatly stripped down versions lacking the sophistication which made the original program so fascinating.

Now, our new IBM PC version possessing the **FULL** power and range of expression of the original is being offered at the introductory price of only $25. And if you want to find out how she does it (or teach her to do more), you can buy the complete IBM Disk BASIC **SOURCE PROGRAM** for only $20 additional.

Order your copy of ELIZA today and you'll never again wonder how to respond when you hear someone say, "Okay, let's see what this computer of yours can actually do!"

AVAILABLE ON DISK IN TWO VERSIONS FOR THE PC

1. Protected Version $25
(Protected Version can be run but not listed or modified)
2. Un-protected IBM Disk BASIC Source Version . $45
(Source Version can be listed and modified as well as run)

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Δ **Digital Research** (160 Central Avenue, Box 579, Pacific Grove, CA 93950; 408-649-3896) has announced an enhanced version of CP/M-86 that it will market for $60. Until now, CP/M-86 has been available only from IBM for $240. The enhancements now offered by DRI include the GSX graphics extensions and a built-in print spooler.

Δ The first in a line of small business software, the *Small Fortune Auto-ledger*, is available from **Emerald Software** (2416 Warren Avenue North, Seattle, WA 98109; 206-282-2100). With a capacity for several hundred income, expense, asset, liability, and capital accounts, the program can compare your expenses to budget on a monthly, quarterly, or year-to-date basis, or determine exact balances of all charge accounts, loans, notes, and so on. Requires eighty columns. $199.95.

Δ Low-cost local-area networking is possible with a new line of port expanders from **Advanced Systems Concepts** (Box Q, Altadena, CA 91001; 213-794-2308). Switches to network with printers also available; units are controlled by embedding ASCII code. Serial and parallel; two and four port. $369 to $520.

Δ A communications package called *Relay* provides simultaneous exchange of files and messages between pcs while printing and editing locally. From **VM Personal Computing** (60 East Forty-second Street, New York, NY 10165; 212-564-0388), it also acts as a TTY, an APL terminal, or a 3270 device for mainframe connection. Requires asynchronous adapter, RS-232 cable, and modem. $89.

Δ **Gold Software** (906 North Main, Wichita, KS 67203; 316-262-1040) has announced *Gold Series II* and *Gold Version 3.* Both provide integrated accounting systems, including general ledger, accounts receivable and payable, payroll, job costing, and so on. Medical billing included in *Version 3* package. Requires CP/M-86, two disk drives, and 128K. $695 to $1,195, depending on application.

Δ A business graphics package for numerical analysis, *Mirrorgraph* can construct bar graphs, pie charts, and multiple line graphs from raw data. Represent up to thirteen months on a single graph. From **Mirror Images** (1223 Peoples Avenue, Troy, NY 12180; 518-274-2335). Requires double-sided disk drive, color/graphics adapter, and DOS 1.1. $59.95.

Δ Turn your dot-matrix printer into a typesetter with *Fancy Font*, a proportionally spaced, hi-res font maker from **SoftCraft** (8726 South Sepulveda Boulevard, Suite 1641, Los Angeles, CA 90045; 213-641-3822). Use your word processor to create your own characters, or print in the fonts supplied: roman, roman bold, italic, sans serif, Old English, script, and fancy script. $180.

Δ Convert old *EasyWriter 1.1* files to your current word processing format using *Make*, from **FreeStyle Software** (1109 Greenhill Road, Philadelphia, PA 19031; 215-387-8208). Send $15 if satisfied after trying product.

Δ *MasterType* is a shoot-'em-up arcade game that teaches touch typing in a space-war format. Seventeen lessons allow students to master the keyboard at their own rate. From **Lightning Software** (Box 11725, Palo Alto, CA 94036; 415-327-3280). $39.95.

Δ The *Software Fitness Program* is a set of seven accounting modules, including accounts receivable with billing and sales analysis, accounts payable, general ledger, inventory, payroll, and so on. From **Open Systems** (430 Oak Grove, Minneapolis, MN 55403; 612-870-3515), it also includes *The Team Manager* report writer. $595 per module.

Δ *Writing in the Computer Age*, by Andrew Fleugelman and Jeremy Joan Hewes, is an illustrated technical manual that teaches you everything you need to know about word processing, from hardware to choosing a word processor and the mechanics of writing and editing. Published by **Anchor Press/Doubleday** (245 Park Avenue, New York, NY 10167; 212-953-4561). Softcover, $10.95.

Δ Preserve, repair, and modify disks using *Disk Mechanic*, from **MLI Microsystems** (50 Hunt Street, Watertown, MA 02172; 617-926-2055). Hidden files can be unhidden, deleted files restored, tracks and sectors determined, and any byte examined. $69.95.

Δ *A Quick Reference Guide to Basic* is published by **John Wiley & Sons** (605 Third Avenue, New York, NY 10158; 212-850-6000). Provides instant access to programming symbols and statements, commands, and controls; arranged on four six-by-twelve-inch laminated panels. $2.95. Δ *The Basic Programming Primer*, second edition, by Mitchell Waite and Michael Pardee, covers Microsoft Basic, Advanced Basic, and other dialects. With self-tests and complete program examples, the book is directed at beginners and students who need to learn the ABCs of the language. Softcover, $17.95.

Δ A science fiction prose adventure that challenges players to save the entire population of a planet in deep space has been released by **Infocom** (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031). *Suspended*, written by science fiction author Michael Berlyn, is a game in which you control six robots that are helping you repair damage on a planet. With you in cryogenic suspension, the six characters act on your behalf independent of one another. You can send them to different locations simultaneously and make subsequent moves. $49.

Δ A complete software patch for *WordStar* allows you to custom select the printer control features you want to use. Create multiple versions of the word processor, depending on the print features you select. From **Enhance WS** (1020 Sagamore Parkway, West Lafayette, IN 47906; 317-463-3546). $49.95.

Δ A family of assembly language subsystem utilities, called *Fabs*, which facilitate keyed access to large, random-record data files is made by **Computer Control Systems** (298 Twenty-first Terrace S.E., Largo, FL 33541; 813-586-1886). $150. Δ *Autosort* provides high-speed sort, merge, and select functions for very large data files. Records may be of any length and any quantity. $150.

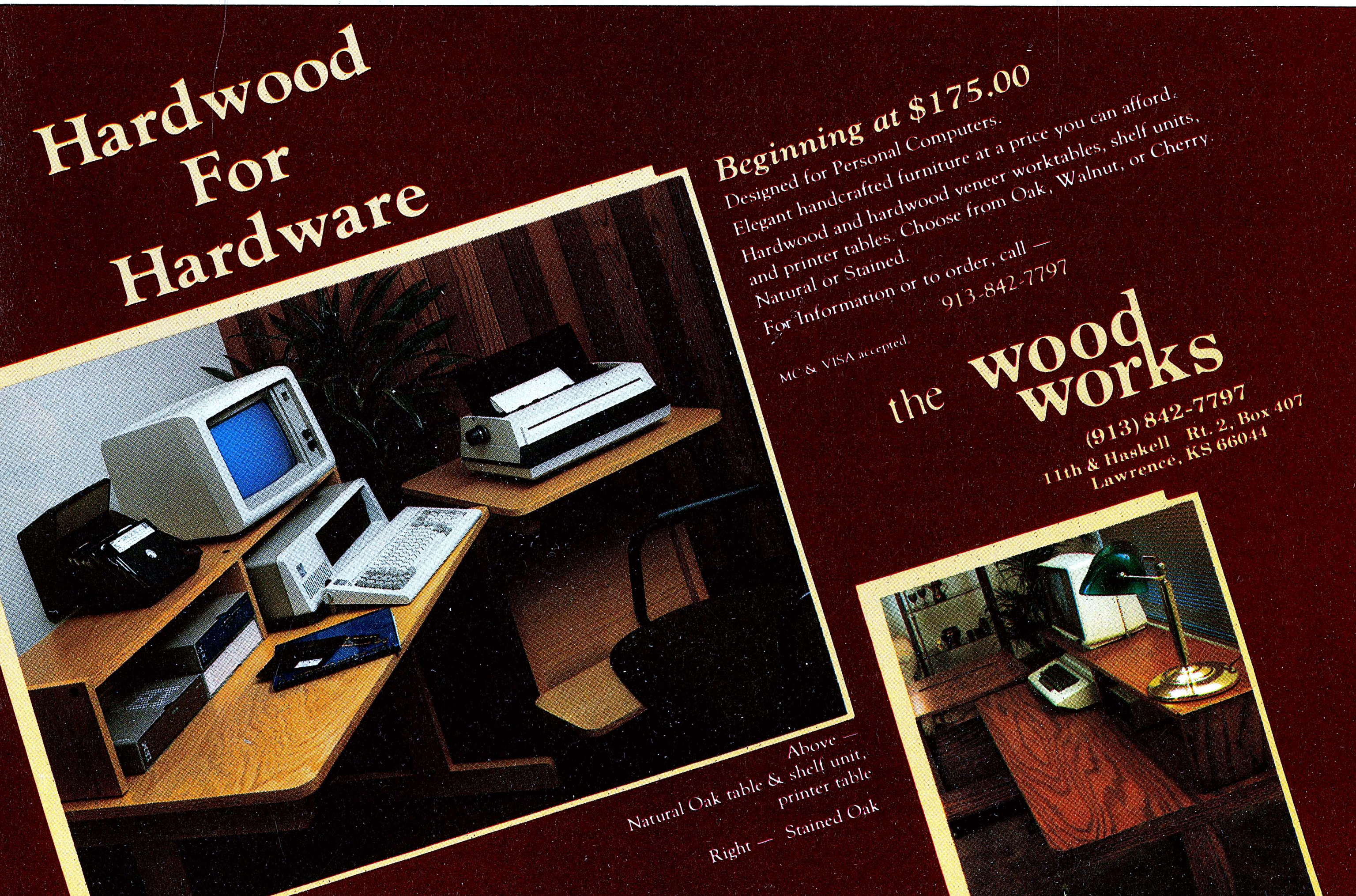
Δ The Canadian Information Processing Society is sponsoring the *1983 CIPS Annual Conference, Session '83*, to be held at the Skyline Hotel in Ottawa, Canada, May 16 through 20. For information, contact **Session '83** (Box 2577, Station D, Ottawa, Ontario, Canada K1P 5W7; 613-234-4333). $275. Nonmembers: $375.

Δ San Antonio will be the site of the first annual *Heart of Texas Computer Show*, scheduled for September 16 through 18 at the downtown Convention Center. The emphasis will be on small business systems. Contact **Heart of Texas** (Box 12094, San Antonio, TX 78212; 512-226-4636).

Δ A complete mailing list and maintenance program, *Sunmail I*, is available from **Sunward Systems** (655 West Irving Park Road, Suite 5203, Chicago, IL 60613; 312-935-5702). Gives complete flexibility in selecting codes; also offers form-letter output. $199.

Δ *The Nutritionist* is an interactive diet analysis program with graphics that displays nutritive analysis of foods and diets, both in weight and percent of daily allowances for nineteen nutrients. From **N-Squared Computing** (5318 Forest Ridge Road, Silverton, OR 97381; 503-873-5906). Diet deficiencies and excesses can be determined and their sources identified for the maintenance of a naturally balanced diet. $145.

Δ *The Draftsman for Colorplus*, from **Plantronics/Frederick Electronics** (7630 Hayward Road, Box 502, Frederick, MD 21701; 301-662-5901), gives you four-color hi-res graphics and medium-res graphics in sixteen colors. Accesses *VisiCalc* for business graphics. Includes HP7470A two-pen plotter output. Requires Colorplus card. $295. ▲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AEROCOMP

BOEING GETS PERSONAL

by David Hunter

Despite heavy criticism and long delays, Congress finally approved the MX ground-based missile system and the B-1B bomber defense projects in 1981. In the middle of one of this country's worst economic recessions, at least the military was going to spend some money. Lots of money.

Defense contractors jumped for joy. The Rockwell plant in El Segundo, California, was like the streets of Chicago on Saint Patrick's Day, recession-conscious employees giddy with newfound hope. It had poured B-1B bombers.

Up at Boeing, in Seattle, it was raining as usual. Rockwell was awarded the lion's share of the B-1B contract, designing and building the actual plane. Boeing Military Airplane Company (BMAC) was approached to produce electronics and avionics systems for the aircraft.

Boeing is a fascinating company, huge, multifaceted, and spread out all over the country. Boeing is probably best known nowadays for its popular commercial airliners, the Boeing 707, 727, 737, 747, and, most recently, the 757 and the 767 built by Boeing Commercial Airplane Company. BMAC has had an impressive output of military airplanes, including the Stratofortress (B-52), the Stratolifter (C-135), and the AWACS. A multibillion-dollar, Fortune-top-fifty corporation, Boeing uses a lot of computers.

Try tons. In one building of Boeing's developmental center (off highway 99 near Seattle), it's possible to find Hewlett-Packards, NECs, DECs, Teracs, IBM Displaywriters, Wangs, IBM mainframes, Xerox Stars, Apples, Northstars, and, last but not least, IBM Personal Computers.

A Computer Odyssey. It doesn't take the wisdom of Athene to see that Boeing does not endorse any single brand-name computer. A careful corporate image demands a nonpartisan stance, but there are practical reasons why Boeing buys so many different kinds of computers. The machine hasn't been developed yet that can do everything they need.

"It depends on the application," says David Schneider, IBM pc consultant for Boeing Computer Services (BCS). "We don't use IBM pcs for much word processing or large-scale number crunching. We have dedicated word processors and mainframes for those tasks."

On the other hand, sometimes the choosing of a particular computer for a department is affected by whimsy. Schneider says the Boeing Commercial Airplane Company (BCAC) went with Hewlett-Packard's 125 because HP's salesman got to them first.

The rumors you may have heard that Boeing had purchased thousands of IBM pcs are just not true. At this time, perhaps two hundred are scattered throughout Boeing's numerous entities. Although the quantity of IBM pcs that Boeing uses is not that noteworthy, the real story is how they use them—what makes the pc uniquely suited to a company already heavily into computers.

In a nutshell, IBM's Personal Computer is both a terrific standalone machine and a versatile desktop workstation for engineers and clerical workers. Software support from independent vendors is strong and the pc facilitates custom programming to suit specialized applications. Engineers particularly find the latter feature all-important.

UTING

If they need to whip out a little Basic program in an afternoon, the pc can handle the job.

The Boeing divisions making the most use of IBM pcs are Boeing Aerospace Company (BAC) and Boeing Military Airplane Company (BMAC). Both are using pcs as intelligent workstations, communicating with larger computer systems, as well as stand-alone tools for engineers.

Secrets of the Heart. By their nature, there are many activities at BMAC we can't tell you about—even if we knew what they were. Whole sections of BMAC's Seattle building are off limits to nonclassified visitors. The basic facts are public knowledge, but for national security reasons we can't get into many details.

BMAC's and BAC's current projects include offensive avionics systems—offensive sensors for navigation and weapon delivery—for the B-1B bomber, the air-launched cruise missile (ALCM), and an antisub missile. In addition to the Seattle area sites, a large part of BMAC is located in Wichita, Kansas.

Boeing's Seattle BMAC site is a three-part, horseshoe-shaped, two-story building, designated 9.90, 9.96, and 9.98 on a visitor's map. It's a labyrinth of long hallways, with massive rooms occupied by dozens of desks and serious employees not used to the attention of the press. There always seems to be some rebuilding and reshuffling going on. A few of the large rooms are empty, but on the whole BMAC is bustling with activity.

Over three hundred engineers are working on the B-1B offensive avionics program, under Chief Engineer Dale Shellhorn. One of the fourteen IBM Personal Computers used by the group resides on Shellhorn's desk.

"I use it for technical and administrative work," he explains. "We keep pulse on an awful lot of material. I mainly use *VisiCalc* and *WordStar*."

David Schneider, an employee of Boeing Computer Services, is currently dedicated to consulting for Boeing Military Airplane Company on their use of IBM Personal Computers.

Shellhorn, who has been at Boeing nineteen years, still remembers the days when he used an IBM 7090 and, until the Personal Computer arrived, it had been fifteen years since he had done any serious programming. Now Shellhorn is teaching himself to program in Pascal, a language he thinks is "just a very structured Fortran.

"It's a nice machine. My guys are using them. Mine is very supportive to me, but the real story is how the troops are using them."

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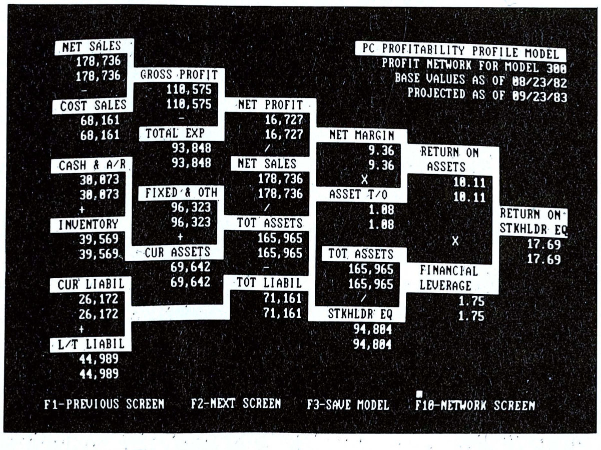

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  68,161  TOTAL EXP       16,727   NET MARGIN
             93,848         /           9.36   RETURN ON
CASH & A/R   93,848    NET SALES        9.36    ASSETS
  30,073                 178,736          X          10.11
  30,073  FIXED & OTH    178,736   ASSET T/O         10.11
    +        96,323         /           1.08                RETURN ON
INVENTORY    96,323    TOT ASSETS       1.08                STKHLDR EQ
  39,569        +        165,965                   X           17.69
  39,569  CUR ASSETS     165,965   TOT ASSETS                  17.69
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BMAC's BCS Connection. When Shellhorn and BMAC decided to order up some IBM pcs, they sought the help of Boeing Computer Services (BCS) and David Schneider. BCS is a full-fledged division of Boeing that has two major functions. One is a commercial section that runs a time-sharing service and produces customized computer systems for industry and government customers. BCS also operates the world's largest privately managed telecommunications network. The other half of BCS provides technical support for all of Boeing's divisions.

Schneider works for the Boeing support half of BCS and is currently dedicated to BMAC.

"We first got pcs in July 1982," says Schneider, "and we didn't know what to do with them. We had problems because there was no training or programming instruction readily available. At that time I started putting together a class in Basic for BMAC employees."

Schneider has been involved with computing for over twenty years. He started on an IBM 1401. "It was exciting when they went from 4K to 8K. Then there was 16K; that was the ultimate machine. Now we have 192K on our pcs."

Schneider combed local bookstores and computer stores for information relating to programming on the IBM Personal Computer. Armed with more than a dozen books on everything from Basic to Pascal, Schneider developed instructional courses tailored to the pc. His students were engineers, engineering aides, and some clerical employees of BMAC.

Schneider's Basic course began with the fundamentals and worked up to reading and writing sequential files. Next came working with random types of files and more advanced functions. Each of the eight or so classes was attended by an average of fifteen students.

"An older engineer who acts like he's never seen a computer is an interesting phenomenon," says Schneider. "Old-time engineers were upset when their slide rules were replaced with calculators. Now computers are something new and every so often you get someone who feels we're upsetting their apple cart again.

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"Then there are the younger engineers who have grown up with computers and are really excited about them. It's no problem, really, but in every class there are usually one or two students with that other feeling. You can spot it right away."

The Learning Company. Another course that Schneider developed concerned DOS and there will certainly be more courses in the future. Schneider is content to wait until the demand is there. When enough BMAC employees are interested in a certain aspect of the pc, Schneider will hold a seminar or develop a class on the subject.

Among the everyday tasks that the "troops" put the pc through is budgeting. Using any one of a number of spreadsheet programs, Shellhorn and others can plug in wildly different variables and "what-if" their way through the budget process. Speed is the key here and when a variable change is made there are none of the arithmetic errors that might occur if it were done by hand.

Status reports and materiels schedules are likewise handled on the pc with either canned software or custom programs. Boeing at any one time is dealing with a host of outside vendors and suppliers. If, for instance, one part of a product is changed, they need to know how that change will affect the other parts of the product. One small change can mean big changes in terms of the product's schedule. And all down the line, the status of the various vendors could change.

Another area where the pc finds work is in the generation of status reports on end items and changes. Changing one aspect of an item can lead to multiple changes. And changing one end item can mean changes to other items. It's always important to know how the parts fit together.

The Hewlett-Packard 7470A plotter is used frequently at BMAC for generating presentation charts—for example, charts illustrating how parts fit into each other. In industrial engineering it is crucial to develop a product with all the parts in mind. The timing involved is important, as well as what kind of tools and other outside items are required to build the product. This kind of work breakdown is a common chore in all the departments of Boeing.

Come and Get It. Schneider is constantly at the beck and call of BMAC engineers and their requests for a particular software package. If the desired program has already been developed into a commercial product, Schneider believes he can always find it. He reads all the major industry magazines and is constantly on the lookout for new programs.

Schneider and his other BCS counterparts also make good use of Boeing's in-house computer store, which acquires and evaluates all kinds of hardware and software for a number of different computers. Schneider not only finds out from them what is available, but frequently if it's any good as well.

The microcomputer technology area of BCS has recently made available for the pc three programs originally written for the Terac. *BitsCalc* is a spreadsheet program with the ability to process 3-D matrixes, facilitating the rolling up from one model to another. *BitsGraph* can produce bar, pie, calendar, milestone, and several other kinds of charts, including view-foils for presentations. *SP Font* is a menu-driven program for generating title pages, view-foils, and other kinds of visual documentation. Schneider, if he chooses, can purchase these packages for use at BMAC.

BITS, or Boeing Intelligent Terminal System, is a Boeing-developed microcomputer-based operating system that enables the integration of a number of microcomputers into a single system using the same language.

Boeing uses a lot of canned software and firmly supports the

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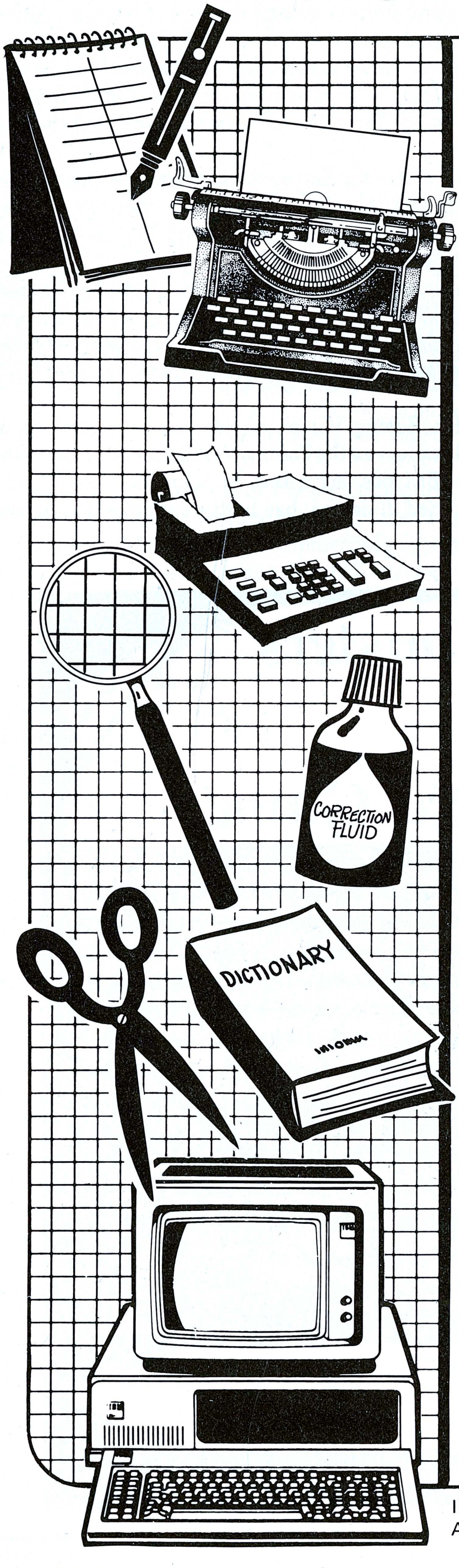

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NORELL Data Systems / 3400 Wilshire Blvd. / P.O. Box 70127 / Los Angeles, CA 90010 / (213) 257-2026 vendor. Duplicating copyrighted material is strictly forbidden and "grounds for dismissal," according to Schneider. "You don't do it or try it."

Another "no-no" is playing games. "PCs are for business," says Schneider, "not games."

The most innovative use BMAC is making of the IBM pc is in conjunction with large computer systems. BCS has several large computer centers, spread out in case of disaster. BMAC is hooked into the BCS network that links them to the major data centers.

Through this network, any part of BMAC can communicate with any other part, be it Wichita to Seattle, Seattle to Bellevue, or Seattle to Vienna, Virginia. BCS has done many enhancements to several popular conversational operating systems.

With the terminal services option (TSO), the pc communicates with a mainframe and acts like an unintelligent terminal. The pc becomes a receptor for data coming off the large-scale machine, data that might as well be coming from a disk.

The pc emulates an IBM 3270 terminal with the conversational terminal service (CTS). You get full-screen edit functions and all powers of display. With both TSO and CTS, BMAC engineers can launch jobs into the bigger machines as if they were a commercial BCS customer.

Take the Data and Run. One of the pc's strong points, according to Schneider, is that it can grab data from a large machine and then process it locally. No longer will engineers always be using valuable big-computer time on jobs better suited to smaller machines.

"Communication is so easy from the pc," says Schneider. "Already configured with 192K and an RS-232 parallel port, all you need is a connecting modem. When I went to see if a pc would work as an unintelligent terminal, I couldn't believe it, I just disconnected the modem from a dial-up terminal and stuck it in the parallel port. I thought I had to have an extra board, the right number of pins on the connector, and all that."

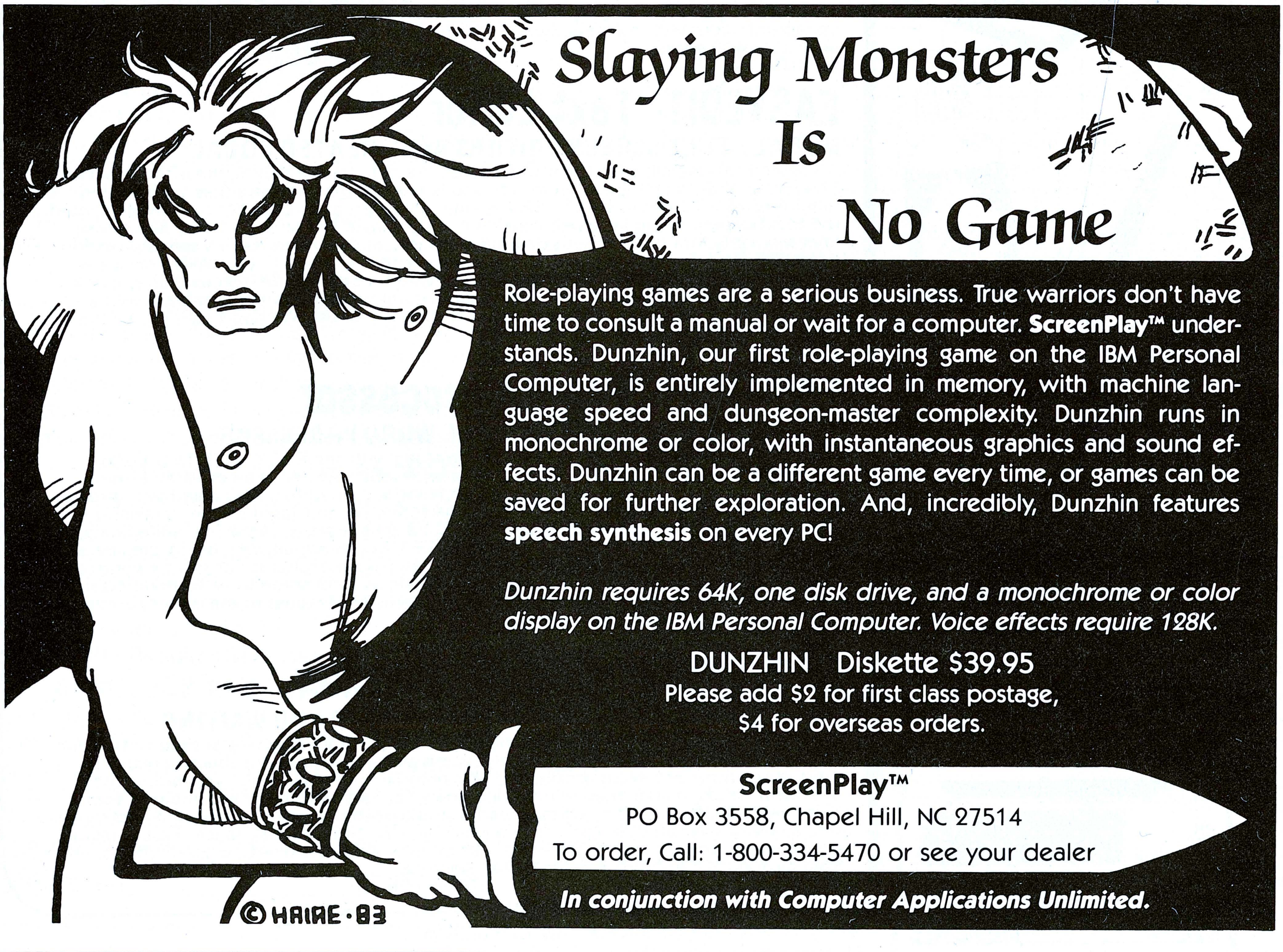
Besides the various BCS and BMAC installations, BMAC engineers in Seattle can also communicate with the Air Force's VAX computer system through pcs. Schneider says it required a different "handshake" but nothing BCS couldn't handle.

The next venture for Schneider in terms of helping little computers to talk to big computers is getting the pc and Boeing's supercomputers together for a chat. Somewhere in the Seattle area are a Cray and Control Data Cyber that Boeing uses mainly for heavy-duty number crunching. The Cray is front-ended by an IBM mainframe, which just handles the I/O. Schneider is confident that the job will be easy.

The IBM pc scene at Boeing Aerospace Company is "just breaking loose," says Schneider. "The other personal computers can't do the job, don't have the capability or the reasonability of IBM's. Its capability to emulate a 3270 terminal is very popular."

BAC uses pcs to access information from the Defense Contract Audit Agency (DCAA). It uses the pc like a workhorse in a workstation environment, says Schneider. BAC also uses the pc with the ability to edit and manage files as a front-end to the Air Force's VAX system.

Big Blue Thunder. Boeing Vertol, in Pennsylvania, makers of such commercial helicopters as the Boeing Vertol 234, is "just on the verge" of acquiring IBM pcs, according to Schneider. Vertol, like many of Boeing's myriad divisions, has both a commercial side and a military side.



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Boeing Military Airplane Company is working on the avionics heart of the B-1B Bomber—offensive sensors for navigation and weapon delivery.

Among the other major Boeing companies, Boeing Commercial Airplane Company, Boeing Marine Systems (which makes hydrofoil boats for the Navy and commercial customers), and Boeing Engineering and Construction (which manages projects like huge windmills), the IBM pc is not much in evidence, but that situation can always change.

At one point, a rumor was going around that the Boeing Employees Computing Society in Seattle was going to get a thousand pcs through Boeing and sell them to members at reduced cost. Although the scheme has stirred up a lot of interest, Boeing has been slow to help out the computing society. Always, there is the concern that it will be misunderstood as endorsing a product.

And don't kid yourself. The IBM pc is a great machine, but Boeing is as complete a microcosm of the computing industry as one could wish for. In the struggle to solve the equation of how many different computers it takes to handle *n* applications, Boeing is long on experience having invested untold amounts of money on computer hardware and spending more every day. IBM pcs are just one part of a swirling storm of computer activity at Boeing.

IBM and Boeing have been on friendly working terms for quite a while. Big Blue is providing the processors with which BMAC is building the avionics system for the B-1B Bomber. Chief Engineer Shellhorn calls Boeing's part of the project "the heart of the airplane."

As fellow contractors on the B-1B Bomber, IBM and Boeing are practiced at dealing with the military. Shellhorn says the B-1 is "a good program. As far as military programs go, it's the best I've ever seen."

Deterring the Unthinkable. A sleek, sexy plane, the B-1B looks a lot smaller than you'd expect, for all of its vaunted firepower. The plane is testimony to our government's renewed interest in producing superefficient, supersophisticated defensive machines. We hope the B-1B will never be called upon to unleash its terrible destructive power.

In such a huge undertaking, the presence of IBM pcs is noteworthy, because so many other kinds of computers are being used. The pc can't do everything (no single computer can), but its unique capabilities make it an important part of the B-1B effort. ▲

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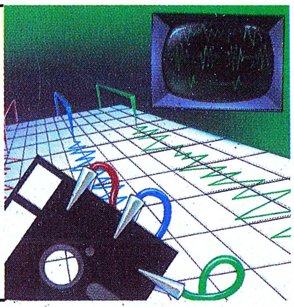

Unless otherwise indicated, software reviewed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

Apple Panic. By Olaf Lubeck. As you might guess, this is Broderbund's adaptation of its Apple program, itself founded on the old arcade game *Panic.*

You control a figure who is confined to a maze of six platforms connected by ladders. You can go right or left, or climb or descend a ladder. The maze is patrolled by a number of monsters that look rather like albino apples. Their touch is fatal. Your only weapon is a shovel. You dig a hole in a platform, wait until an albino apple falls in, then cover it up.

The monsters move randomly. At the higher levels of difficulty, they multiply and are joined by even more dangerous creatures—the Green Butterfly that can be killed only by a two-story fall, and the Mask of Death that has to fall at least three stories. Unfortunately, all these proliferating monsters slow down the game to a crawl. By about the fifth level, reflexes are no longer a factor. What kills you are the game's eccentricities or being surrounded by an overwhelming number of monsters.

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There are a number of improvements on the Apple version. It is easier to line one hole above the other, and monsters can no longer attack you through a partially dug hole. On the other hand it is no longer possible to change your mind and fill up a hole once you have started to dig it, and there is no key to stop moving. Also, Broderbund has added some sound effects. You hear a regular tick-tick-tick as your player moves around the display. When he clears a screen of monsters, the machine plays "Pop Goes the Weasel." If the monsters clear the screen of you, it's "Oh, Dear, What Can The Matter Be?" Since there is no command to turn the sound off, it's best to play when there is no one else in the house. Just as irritating, there is no pause feature, and high scores are not saved to disk.

Apple Panic was a popular game when it first came out for the Apple. But that was years ago, and Broderbund has improved it little if at all. The folks from San Rafael will have to do better if they want a piece of the IBM market. **fj**

Apple Panic, by Olaf Lubeck, Broderbund (1938 Fourth Street, San Rafael, CA 94901; 415-456-6424). $34.95.

JFormat. By John Henderson. This is a multipurpose enhancement of PC-DOS that includes electronic disk and memory allocation, disk formatting in a variety of formats, high-speed file transfer, and support for hard disks. In contrast to the way standard PC-DOS uses two physical disk drives (A and B), *JFormat* manipulates up to six logical channels, each of which may be defined as either physical or electronic disk.

The copy-protected program formats disk in the standard single- and double-sided IBM format (eight sectors per track). You can also format disks for quad-density, eight-inch IBM 3740, eight-inch giant, eight-inch large, and three ten-sector/track formats (single-sided, double-sided, and quad-density). The ten-sector formats allow data storage 1.25 times greater than the standard eight-sector formats. Thus a single-sided disk can hold about 200K instead of 160K, a double-sided disk 400K instead of 320K, and a quad-density disk an outrageous 811K instead of 651K. All allow formatting as system disks (those on which the system will boot on them) or as data disks. When you format a system disk, you can include a memory-management utility called Jel.com.

Understanding Jel's operation requires a slight alteration in your thinking. Instead of A and B drives, think of A and B as designators for logical channels—which may be physical drives, electronic analogs of physical drives, or physical drives with nonstandard formats. Jel has six such logical channel designators (A through F). The special designator S always represents the system's available central memory.

System memory is allocated in banks of 64K. The command *Jel S1* allocates 64K to central memory, *Jel S4* allocates 256K, and so on. Undesignated excess memory is automatically available for electronic disk operations. Putting memory allocation under software control and allowing the user to change it at any time is one of *JFormat*'s strongest features. Other electronic disk systems require you

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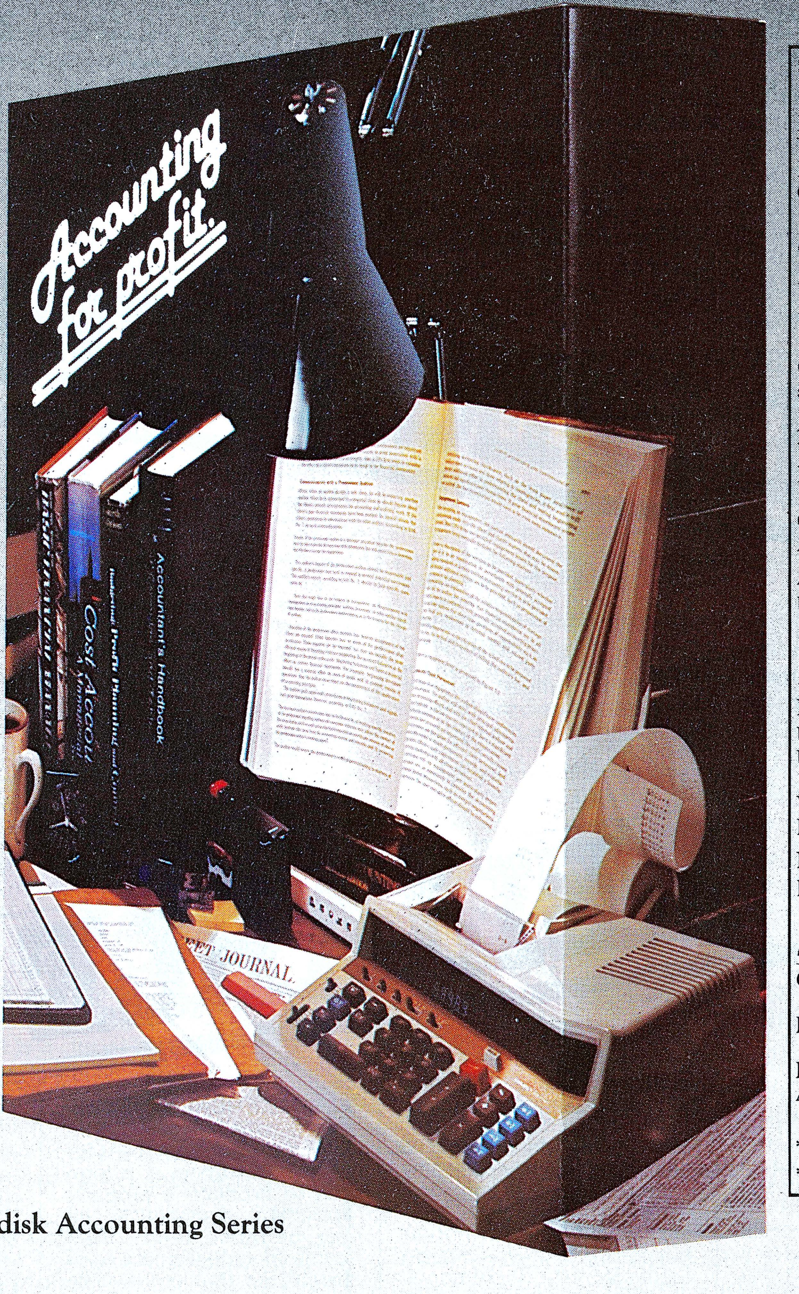

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to change switch settings inside your machine to alter memory allocation.

Any of the six logical channel designators may be defined as electronic disks by using a zero in a Jel command. The command *Jel A0 C0 S2* defines drives A and C as electronic and allocates 128K for central memory. If this system had 320K installed, 128K would be used for the system and 192K would be available to "drives" A and C as electronic disk. Jel's syntax has conventions for the different formats of physical disks, but they're superfluous; Jel automatically senses a drives format, so a single convention representing "physical disk" would have sufficed. The formatting procedure of disks produces any desired system configuration automatically when the system is booted. You can override this default configuration at any time with a Jel command.

The idea of logical channels doesn't mean that operations with *JFormat* are complicated. Only the procedure for formatting disks is unusual. Once the system is booted with a JFormatted disk, the enhanced operating system (now called JDOS) is transparent to the user. Unless you need JDOS's extra capacities, you operate as with PC-DOS.

JDOS has one anomaly: the *diskcopy* command won't work with it (and the documentation gives you no warning). Even an attempt to copy one standard IBM-formatted disk to another will produce an unbootable new disk. Since there's no way of knowing that *diskcopy* hasn't worked, the problem isn't revealed until you try to boot the new disk. *JFormat* users should reboot with standard PC-DOS before attempting a *diskcopy* operation.

The absence of the *diskcopy* command requires a fast copy routine to replace it. *JFormat* has a gem: a fast and powerful utility called Jet, which is not only generally faster than the PC-DOS alternatives but more selective. It only copies files that do not exist on the target or that exist with a different time/date stamp.

Jet has five useful options you can include in the syntax as switches: /U, an update utility, copies only the files that do exist on the target; /E, a destructive copy routine like *diskcopy,* erases the target before copying from the source; /A transfers files from hard to floppy disks, appending overflow portions that won't fit on the floppy; /F transfers specific files named in a previously created ASCII file; /X functions like /F but, before copying, erases target files not named in the ASCII file.

Jet's options make *JFormat* an extremely powerful utility for speeding transfers to and from both electronic and hard disk. For example, a transfer from physical to electronic disk of twenty-five files containing 79K required one minute, twenty seconds with the DOS *copy* command. Using Jet's /X option, the same operation took only ten seconds. A second attempt required only three seconds; Jet sensed the files already were copied and attempted no further transfers. (These previously nonexistent enhancements of Jet are new with release 1.75.)

JFormat supports hard drives from Datamac, Davong, Corvus, Xebec, and Tecmar. In general, it supports drives that use DTC, Xedex, or Western Digital controllers, and phone consultation is available. *JFormat* doesn't currently support hard drives from Corona or Tallgrass.

Program operation is generally smooth and free of serious bugs or anomalies. The syntax is straightforward, compact, and well considered. The documentation, however, is terrible. This is unfortunate; *JFormat* is a useful, powerful set of utilities obscured by murky and cryptic documentation. Since the concepts a user needs to understand can be expressed without undue difficulty, it would behoove Tall Tree Systems to translate this documentation into English.

Telephone support, on the other hand, is superior. Questions (which usually arise from the documentation rather than the program) are answered immediately, courteously, and accurately.

Once you sample electronic disk operation, you'll find it pain-

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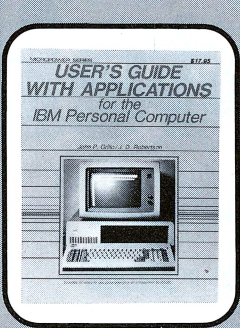
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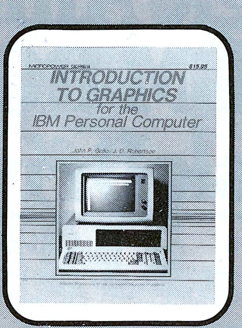

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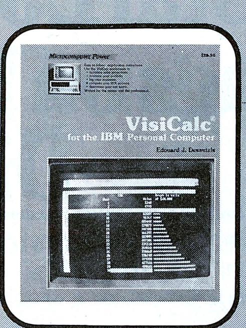

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ful to go back to standard physical disks. Programs that swap between central memory and disk, in particular, show dramatic improvement. *WordStar,* for example, which requires fifty-four seconds to move the cursor from one end of a thirty-four-page document to the other, takes only nine seconds for this task when swapping on electronic disk. Other programs, especially database managers that search and sort records, show similar improvement. *JFormat* is a powerful, easy-to-use system for such operations. ba

JFormat, by John Henderson, Tall Tree Systems (1036 Los Altos Avenue, Los Altos, CA 94022; 415-941-5500). $60.

Basic Development System. By Ken Snapp. This set of seven utilities is a must for every pc-Basic programmer/software developer. *Basic Development System* will generate a cross-reference table; locate specific strings and keywords; examine current values of variables; step through a program a line at a time; renumber, relocate or duplicate blocks of code; compress code to occupy less memory and run faster; and recapture some readability for previously compressed code.

No programmer should be without a cross-reference table to keep track of variables and numeric constants. *BDS*'s cross-reference utility lists program variables by type—and the line numbers where they are used or defined.

BDS's Find utility similarly cross-references strings and keywords. It will locate all references to *for, next, goto,* and *gosub.* Writing your own adventure? Use Find to locate the missing clove of garlic. After debugging, use Find to locate remarks and transient messages you want to eliminate.

During debugging, *BDS*'s trace mode eliminates the need to insert transient error messages and snapshot dumps. Before each line is executed, the line number is displayed in your screen's upper-right corner and execution is suspended until keyboard input is detected. You can call for a printout of the current values of all variables, jump to a predesignated line number, or continue a step-by-step trace. From a printout of the current values of variables, you'll easily spot variables that haven't been initialized or have dropped through the cracks of *for-next* loops.

The renumbering utility alone may be worth *BDS*'s price. You can renumber a block at a time, rather than an entire program, plus relocate or duplicate blocks of code, and locate undefined lines. Best of all, *BDS* automatically updates all references to the original line numbers wherever they occur in your program. Line renumbering can be risky, but fortunately the utility's built-in safeguards include aborting the renumbering operation if newly generated line numbers overlap the original ones.

You can use the renumbering utility during beta test to search for and display undefined lines. If your last Basic program contained "on error goto 6000," and you forgot to write a special error recovery routine and locate it at the end of the program, *BDS*'s renumbering utility will jog your memory.

Compressing a program can reduce substantially the size of your execution modules, sometimes by as much as 60 percent (the manual claims a conservative 30 to 40 percent). Use *BDS* with a 128K pc to develop and compress a program for 64K, or even 32K, systems.

The compression utility removes remarks and other nonexecutable code, irrelevant blanks, extraneous colons, end quotation marks, and redundant *gotos* in *then goto* and *else goto* sequences.

While it can't restore remarks, of course, *BDS*'s Uncompress utility will, if a program is unintentionally compressed, insert spaces into program code, separate multiple statement lines into single program lines, insert missing variable-typing characters corresponding to the defaults in effect, and indent statements contained within *for-next* and *while-wend* loops.

You can patch *BDS* into either *Disk Basic* or *Advanced Basic,* versions 1.05 and 1.10. Its two operation modes allow adaptation to various memory and disk configurations. The memory-resident mode, more desirable for software development, requires 11K and eliminates any need to access the *BDS* disk file after Basic initializa-

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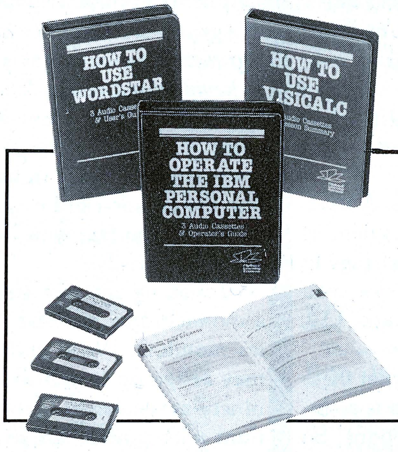
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tion. The slower disk-resident mode will run in computers with 32K or less.

Installing *BDS* requires two sets of file transfers (mainly for backup reasons) and about four minutes. The excellent documentation requires only a cursory read-through. You'll master *BDS* easily the first time you use it. kn

BASIC Development System, by Ken Snapp, Softool Systems (8972 East Hampden Avenue, Suite 179, Denver, CO 80231; 303-793-0145). $99.

B.C. The Business Card Organizer. This attractively designed, menu-driven little program lets you record all the information on your collected business cards, or the names and phone numbers of your friends, if you prefer. You can call up cards by name or business, a two-character code of your own devising, or even search by date. It makes a useful appointment reminder for those who like to be tickled. A "comment" line permits brief descriptions or notes. *B.C.* also prints its information, either in report format or as individual mailing labels. jl

B.C. The Business Card Organizer, by Specific Software, Bazzel Branham (2285 Peachtree Road, Suite 204, Atlanta, GA 30309; 404-352-5674). $89.95.

ProKey. By David K. Rose. **Keynote.** By Gerard J. Cerchio. A trivial description of these two innovative and powerful programs is "keyboard enhancer." The programs allow you to assign strings to various keys. For example, if you frequently format disks, you could assign *format B:/s* to F1, *dir a:* and *dir b:* to F9 and F10, and so on.

Keyboard enhancement is too limited a description of what these programs do. They are actually macro processors. A macro is a single instruction that invokes a series of additional instructions. So viewed, these programs become general-purpose utilities that can unlock tremendous potential in the pc. Since they're designed to work in conjunction with other software, they can redefine program commands, create turnkey systems or front ends to invoke programs in particular ways, ease transitions between interrelated programs, and, of course, reduce typing effort.

The programs have many similarities. Both must be initialized before use. Both allow you to read into memory with a single command a previously saved set of assignments. Both permit reassignment of keys during the operation of other programs, and both clear all key assignments with a single command.

The syntax of both programs is elegant and easily mastered although the operation of the two programs differs considerably. *Keynote* is initialized with the command *keyin* or the less powerful *keyon*, which doesn't allow you to change assignments while running other software. *Keyin*, however, uses more central memory, an important consideration in a system with 64K or less.

Assignments are made in various ways. *Key many* makes assignments until you suspend the routine. *Key restore filespec* brings in a group of assignments simultaneously, an option to invoke if assignments previously were saved with a *key save filespec* command. A *keyin* initialization lets you make assignments at any time with the alt-K combination. Key assignments may be eliminated (*key clear*), suspended (*key off*), and listed (*key list*). An editing utility corrects errors made in key assignments (the gray minus key works like the cursor-right or F1 key in DOS and Edlin). This is the full command syntax; you need not learn much more to use the program effectively.

Invoking any key assignment command clears the upper half of a monochrome monitor (the whole screen clears on a color/graphics monitor). When the prompt *Designate Key:* appears, the user may assign up to approximately sixty thousand characters to any of ninety-seven keys—forty function keys or function-key combinations with control, alt, or shift keys, including all alt-alphanumeric combinations, plus shift-tab, insert, delete, print screen, backspace, numeric keypad keys (excluding the 5), and control-numeric keypad key combinations (excluding cursor-up and cursor-down). Carriage returns within strings are indicated with the numeric keypad plus key. Key assignments are terminated with the enter key.

ProKey's command syntax is even more compact and elegant. All functions begin with *prokey*, followed by a filespec argument, where relevant, and a switch setting: */r* (read in a previously defined set of assignments), */w* (write a set of assignments to a file), */c* (clear assignments), */i* (initialize *ProKey*), and */q* (quit *ProKey*). The */i* switch is unnecessary if the program hasn't yet been initialized; the */r* switch simultaneously initializes the program and reads in a set of assignments. *ProKey* doesn't have a built-in editor; however, unlike *Keynote*, it saves assignments in standard ASCII files, which are addressed easily by Edlin and other editors.

ProKey initiates assignments with the alt-equal sign (=) combination, which changes the cursor position from low to high. The user then types the key to which the assignment (strings of up to approximately one thousand characters) is being made. *ProKey* allows assignments to all the *Keynote* options, plus thirty-six more. Assignment routines terminate with an alt-minus combination.

ProKey has two important capabilities that *Keynote* doesn't. First, it can merge one set of assignments into another with a simple command. *Prokey filespec/m* causes the filespec assignments to override previous assignments without altering remaining assignments. Thus you can supplement one set of assignments while operating with another.

Second, *ProKey*'s greater power lets you define keyboard input fields as a part of assigned strings. When *ProKey* encounters one of these fields, the cursor shape changes to indicate that *ProKey* is waiting for keyboard input. Following keyboard entry, the string continues execution. You can even define a new key assignment within a string that is being executed, and the new assignment may then be used later in the same string in which it was defined or be picked up by another string.

The program supports fixed and variable fields. Fixed fields cause string execution to resume as soon as a predefined number of

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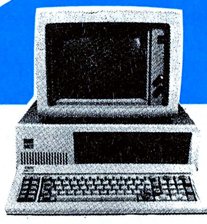

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This month we are offering (3) three outstanding peripheral products. The first area is memory. The IBM PC DOS can recognize 640K of add-in memory. The VISTA "maxicard", through multilayer technology, adds 576K which if added to your existing 64K maximizes the memory in one slot. The 576K card is supplied at no additional charge with Dynadisk™ software to emulate a disk drive which allows you take advantage of the fast access times that RAM disk provides. For extended worksheet capabilities you can use "SUPERCALC™" supplied with the card at no extra charge when the fully populated card is purchased at ACP.

The second card featured this month also comes from VISTA. The popular "PC Master" represents the highest level of multi-function I/O available on one card for the PC at any price. The "PC Master" features (2) two RS-232 serial ports which the primary serial port is configurable as DTE or DCE. It has a parallel printer port (IBM compatible), game joystick port, real time clock/calendar with auto recharge, Vortrax speech synthesis, 2 watt audio amplifier, and a Xebec/Seagate compatible hard disk host adapter (SASI compatible). All of this is on **one** card and is software supported with the exception of the host adaptor which will be released in the 1st Quarter of 1983.

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characters is entered, while variable fields cause string execution to continue when a carriage return is encountered. A field is easily defined as part of a string by using control-minus for a variable-field delimiter or control-] for a fixed-field delimiter.

The use of fields and the recursive possibilities in the syntax greatly increase the program's usefulness. For example, you might define alt-A as a field to take input from the keyboard. A subsequent key assignment can then call for alt-A as a part of an assigned string. An application example would be automatic saves of a file to disk without leaving your word processing program. Another application is to bring a user-defined variable into a program for subsequent use in that program. This capability allows the creation of front ends for various applications programs.

Both programs have anomalies, none particularly serious if the user is aware of them. Both will run on 64K systems, but 96K apparently is necessary when combined with some programs. For example, one Basic database manager, which runs successfully in a 64K system, generates an "out of memory" message when combined with *Keynote* or *ProKey*. No problems occur when the combination is run in a system with more memory (or when *Keynote* is initialized with *keyon*).

Neither *Keynote* nor *ProKey* runs successfully with one commercial Basic communications program that apparently uses addresses in reserved areas of memory. *Keynote* has trouble with Basic programs containing a *beep* command or engaging in certain file operations; the keyboard can freeze, requiring a system reset. *ProKey* does not permit typing ahead while it brings in a new set of assignments with the */r* switch.

Program comparison indicates that *Keynote* runs slightly faster than *ProKey*. *Keynote*'s *key many* command makes simultaneous assignments easier than in *ProKey*. The *keyon* command allows a weak version of *Keynote* (assignments cannot be made while an application program is running) to function with less central memory, perhaps making it the program of choice for systems with 64K.

ProKey, on the other hand, is the more powerful and flexible program. Its ability to define fields, combined with its use of a recursive syntax, permits important applications inaccessible to *Keynote*. *ProKey* is also less obtrusive and easier to use in combination with other software.

ProKey's current version is 2.11, and *Keynote*'s has the legend "A Key Software Series 1 Creation" on the disk label; both are major improvements over earlier releases. If you own one of these programs, contact the author. In both cases the update fee is only five dollars.

Both programs are creative, elegant, and powerful utilities. Those who haven't used these programs can't appreciate their significance. Few software investments have such broad applications. Most programs that function in the PC-DOS environment are enhanced with *Keynote* or *ProKey*. New applications constantly occur to the user and are easily implemented, even when other software is loaded. Use either program for a few weeks and you'll find it difficult to do without it. bo

Keynote, by Gerard J. Cerchio, Advanced Software Interface (2655 Campus Drive, Suite 260, San Mateo, CA 94403; 415-572-1347). $99.95.

ProKey, by David K. Rose, RoseSoft (4744 Ninth Avenue N.E., Box 5850, Seattle, WA 98105; 206-632-3603). $79.95.

Cosmic Crusader. By Michael Abrash. "Your only hope is to track down the alien fleets and keep them from reaching home base. When you catch them, you must fight off their intricate defensive maneuvers, dodge their torpedoes, destroy their refueling stations for extra shield energy, and to zap their flagship torpedoes."

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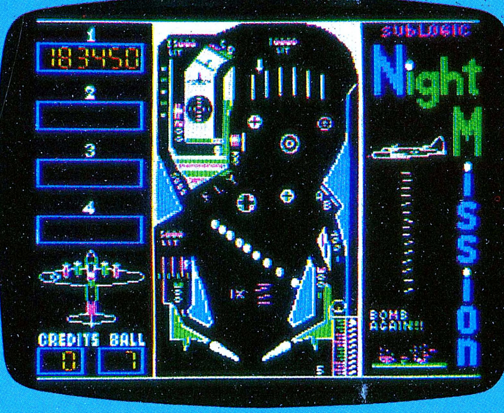

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*And most other programs.

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The Earthling is at a severe disadvantage because the computer can keep track of only one shot at a time. (For maximum fire, just hold down the key.) You can't shoot at all when your shields are activated.

However, the game has all the professional features we have come to expect from Abrash. There are nine levels of difficulty. You can use a joystick, but if you choose to use the keyboard you can adjust the keys to your own convenience. There is a pause feature. High scores are saved to disk. The sound can be turned off.

If "E.T. Go Home" is your motto, this game is for you. fj

Cosmic Crusader, by Michael Abrash, Funtastic (5-12 Wilde Avenue, Drexel Hill, PA 19026; 215-622-5716). $38.95.

The FinalWord. This is a superior word processing program with a clear, clean design that takes full advantage of the pc's features. Its capabilities include superscripts, subscripts, true proportional spacing, boldfaced and underlined text, and multiple fonts for printers with more than one character set or typeface. For writers of books and manuals, *The FinalWord* conveniently builds appendixes, indexes, footnotes, tables of contents (constructed directly from chapter, section, and subsection headings), all of which can be numbered automatically.

Forty frequently used function sequences are controlled by function keys, which you may redefine if you prefer different actions. More complicated and less common functions require two to three keystrokes, but the command sequences make mnemonic sense. For example, control-W moves the cursor forward one word; control-P moves it a paragraph. If you forget the commands, press control-X (for *ex*tended commands), and in one second a list appears. An additional help function provides explanation for keyword topics.

If your power fails, you lose only a few lines. That's because the program uses a large disk buffer for files "in" the editor. Changes (not the whole file) are saved to this buffer frequently.

You can have a number of files "in" *The FinalWord* at one time; the disk buffer is not limited to one file. You can switch between files quickly and transfer information. Further, you can split the screen, with a different file in each half, referring to one article while you write another.

The FinalWord requires only 64K, although 128K increases the speed of some functions.

The program has two formatting modes. With the "what-you-see-is-what-you-get" mode, which works well for letters and short memos, you can justify and underscore text on-screen. The "advanced formatter" mode has advantages for longer documents, and its commands are spelled out in full—no abbreviations. These in-line commands need not appear at the beginning of a line; they can appear anywhere.

Any shortcomings? Some. The facility for form letters is awkward. Multiple-column output for magazine style is not possible. There's no automatic hyphenation of long words. Wide tables are a problem, since the eight-character screen simply folds additional characters back to column 1; there is no horizontal scrolling. The program doesn't support long documents, such as book manuscripts, as well as you might like. Also, the advanced formatter mode formats an entire document before printing, creating a large intermediate disk file. This limits document size unless you have a hard disk.

If you don't need to construct wide tables or multiple-column documents, this is an excellent program (with a detailed tutorial) at a good price. js

The FinalWord, by Mark of the Unicorn (Box 423, Arlington, MA 02174; 617-489-1387). Double-sided disk drives recommended. $300. ▲

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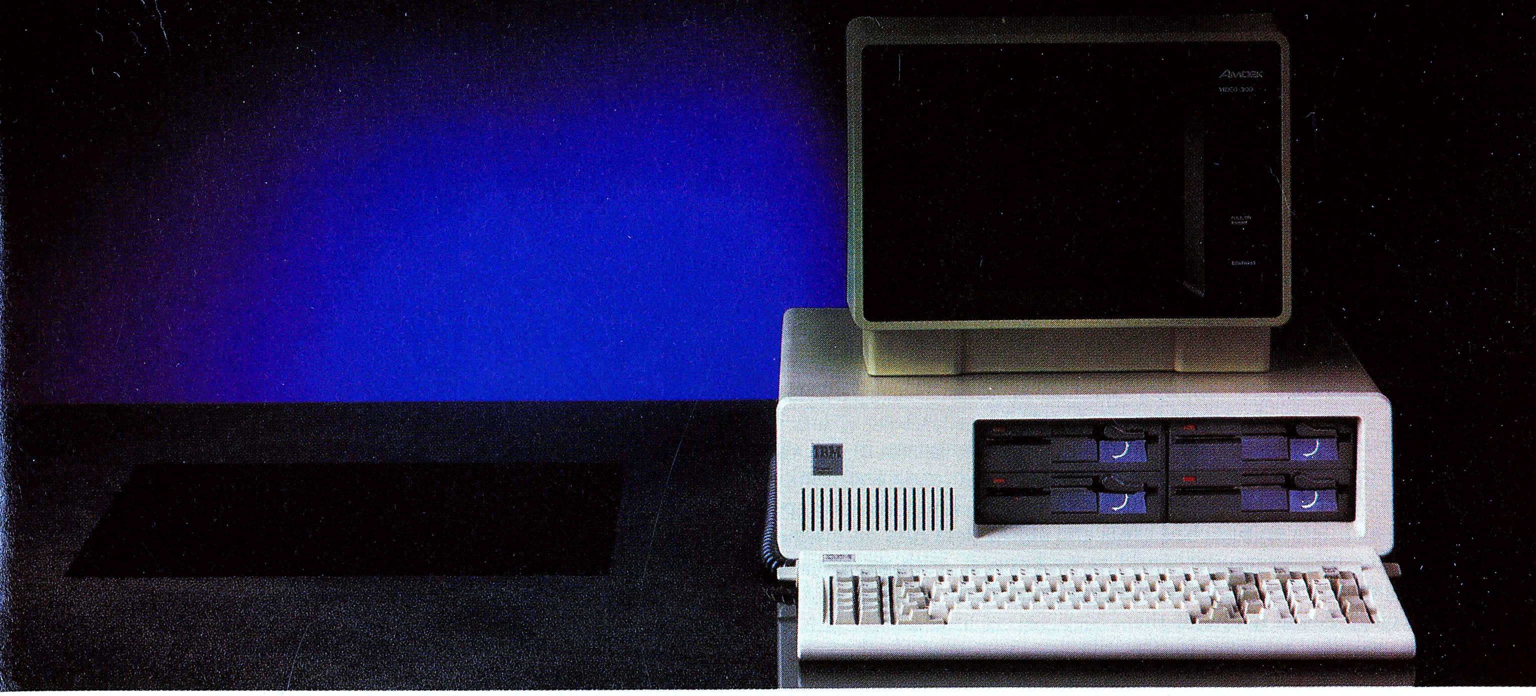

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PASCAL

EXTENDED

PART ONE OF THREE PARTS

by Dara Pearlman

When Niklaus Wirth created the Pascal language in the early 1970s, computers were enormous machines whirring and blinking in their own special air-conditioned rooms. They accepted programs and data on punched cards and stored data files on magnetic tape. The microcomputer world as we know it, with its interactive terminals and floppy disks, had yet to be born.

Today Pascal is one of the most popular microcomputer languages, but in its original, standard version, it still expects its input to mimic punched cards and its output to look like sequential tape files. To bring Pascal up-to-date and take advantage of the new hardware, most microcomputer manufacturers have added extensions to the language.

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In this series article and sequels to it we will look at some of the extensions in IBM Personal Computer Pascal running under PC-DOS and see how they can make your Pascal programming easier. This article will show you how to use the IBM Pascal character arrays, *string* and *lstring*.

The *string* and *lstring* are useful because Standard Pascal offers no equivalent to the string variable in Basic that stores characters, words, or lines under a single variable name, such as Title$. Instead, Standard Pascal requires you to use array notation for character strings. When you read or write data, you have to loop through the array, processing one character at a time.

IBM Pascal streamlines this process with the two predefined arrays, *string* and *lstring*. For added flexibility, the *string* and the *lstring* each have a subtype with slightly different characteristics. Each type has its own advantages and special quirks. We will look at each in turn and then discuss how to choose which one to use.

Vive la Difference. If you've worked with UCSD Pascal, the IBM Pascal *string* will look a lot like your old friend, the UCSD Pascal *string*. However, there are enough subtle differences to make a formal introduction worthwhile. In its common form, it is simply shorthand for the familiar Standard Pascal array notation for character strings, such as

```
VAR NAME: PACKED ARRAY[1..20] OF CHAR
```

In IBM Pascal this can become

```
VAR NAME: STRING(20)
```

Note that in both cases you must declare the size of the string. Each occurrence of Name will take up twenty bytes of storage. The compiler will accept a *string* as small as one byte and as large as 32,766 (*maxint−1*) bytes.

Use of the IBM Pascal *string* frees you from a lot of mundane housekeeping. With the array notation you must read and write the array Name one character at a time. If Name is less than twenty bytes, you must include code to pad the rest of the array with blanks. With the IBM *string* you may read or write Name with one line of code. If the *string* is too short, IBM Pascal will pad it with blanks for you. For example, to read the Standard Pascal array Name we defined above from the keyboard, our code would be

```
FOR INDEX := 1 TO 20 DO
          IF NOT EOLN THEN
                    READ (NAME[INDEX])
          ELSE
                    NAME[INDEX] := ' ';
```

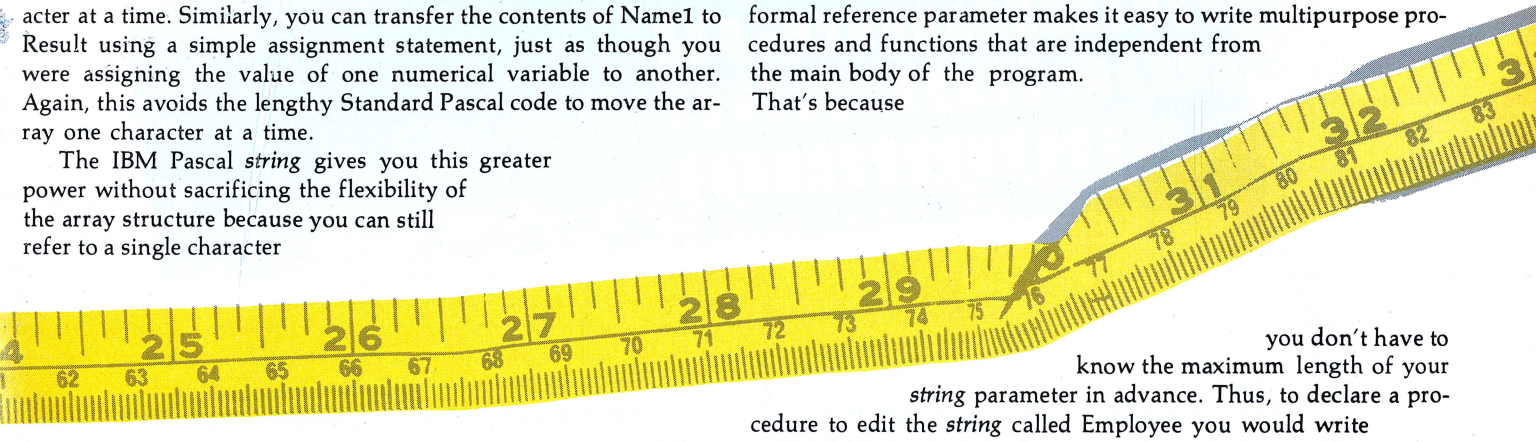
This loops through the array twenty times, reading one character at a time. If the program detects the carriage return *eoln*, it pads the rest of the array with blanks. Now, if we define Name as the IBM Pascal *string* with a length of twenty bytes, we can accomplish the same thing by writing

```
READLN (NAME);
```

The added power of the *string* doesn't end here. If you want to compare two *strings* in a sorting routine, you can do it in a single statement, providing that both *strings* have the same maximum length. Similarly, you can directly assign the value of one *string* to another in one statement, again providing that both have the same declared length. As an example, look at this simple program which compares two names and then displays the one that comes first in alphabetical order.

```
PROGRAM COMPARE (INPUT,OUTPUT);
VAR
          NAME1,
          NAME2,
          RESULT:    STRING(20);
BEGIN     (*PROGRAM COMPARE*)
          WRITELN ('ENTER 1ST NAME');
          READLN (NAME1);
          WRITELN ('ENTER 2ND NAME');
          READLN (NAME2);
          IF NAME1 < NAME2 THEN
                     RESULT := NAME1
          ELSE
                     RESULT := NAME2;
          WRITELN (RESULT,' COMES FIRST');
END.      (*PROGRAM COMPARE*)
```

Note that all of the *strings* have the same declared maximum length of twenty characters. If you try to compare or assign *strings* of different lengths, the compiler will reject your program. However, in this case you can compare Name1 with Name2 in one statement, without using a cumbersome loop to compare them one character at a time. Similarly, you can transfer the contents of Name1 to Result using a simple assignment statement, just as though you were assigning the value of one numerical variable to another. Again, this avoids the lengthy Standard Pascal code to move the array one character at a time.



The IBM Pascal *string* gives you this greater power without sacrificing the flexibility of the array structure because you can still refer to a single character in the *string* using an array index. Thus, if the contents of our IBM Pascal *string* called Name is "JOAN SMITH," we can determine whether the first letter is "J" by writing

```
IF NAME[1] = 'J' THEN
  WRITELN ('THE FIRST LETTER IS "J".');
```

Until now we've been talking about the common, garden-variety *string* that has a declared maximum length. There is also a more exotic variety that the IBM Pascal manual refers to as the "super array type *string*," which can exist "as a formal reference parameter type or pointer referent type" (page 6-16).

Strings Unlimited. This terminology is confusing as well as intimidating, especially when you go on to read that the formal definition of *string* is a type derived from the IBM Pascal super array. We will try to clear up this confusion when we look at super arrays in greater detail later in this series. Meanwhile, let's call this exotic "super array type *string*" by a simpler name. The main feature distinguishing it from the common *string* is that it has no declared maximum length, so for our purposes it will be the *unlimited string.*

IBM Pascal lets you use an unlimited *string* in only two ways. One is as a reference parameter in a procedure or function declaration. Pascal textbooks make the distinction between passing a parameter by value or passing it by reference. A value parameter is the simpler of the two. It appears without the prefix *var* in the parameter definition, and its value remains unchanged in the procedure or function. In IBM Pascal it has an additional distinction on the machine language level: the value of the actual parameter in the calling statement is physically copied to a new location in the called procedure or function.

On the other hand, when you pass a parameter by reference you add the prefix *var* to the parameter definition, and you can change its value in the course of the procedure or function. In IBM Pascal, the machine language treatment of a reference parameter is different also. Instead of physically copying the parameter value to a new location, the program passes the memory address of the parameter to the function or procedure. Any changes to the value of the parameter happen directly, in its home location. This uses less memory and is especially valuable for variables that take up a lot of space, such as a *string.*

Because *strings* can be as large as 32,766 bytes, the compiler will not allow you to pass *strings* by value. Unlimited *string* parameters must be reference parameters. To declare a reference parameter, you add either the prefix *var* or the prefix *const* to your parameter definition. Use of *var* is Standard Pascal. *Const* is an IBM Pascal extension that allows you to use constants as well as variables as reference parameters.

Declaration of Independence. Use of the unlimited *string* as a formal reference parameter makes it easy to write multipurpose procedures and functions that are independent from the main body of the program. That's because you don't have to know the maximum length of your *string* parameter in advance. Thus, to declare a procedure to edit the *string* called Employee you would write

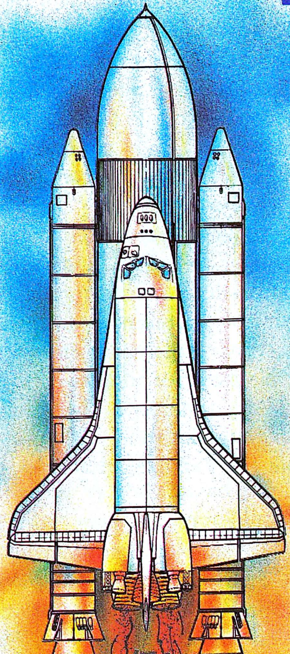
```
PROCEDURE EDIT (VAR EMPLOYEE: STRING);
```

Note that the definition of the parameter *Employee* has no size limit. The compiler will give you an error message if you attempt to include a limit in a formal reference parameter declaration. Note also that the *string* is a variable parameter preceded by *var.* If the procedure does not change the contents of Employee, you may use the prefix *const* instead. The compiler will not accept a *string* parameter without one of the two prefixes.

Once you pass your actual parameter, a limited *string,* to the unlimited *string* in the procedure or function, you may be in for a surprise when you try to work with it. That's because an unlimited *string* doesn't behave the same way a limited *string* does. While you can still read or write an entire unlimited *string* in one statement, you can't compare it to another *string,* and you can't use an assignment statement to move an entire unlimited *string* at once. If you want to do comparisons or assignments, you must copy the unlimited *string* to a limited *string* for further manipulation.

To illustrate how to work with an unlimited *string,* let's expand our example of the Edit procedure.

```
PROCEDURE EDIT (VAR EMPLOYEE1,EMPLOYEE2:
                    STRING);
VAR
          LENGTH1,
```



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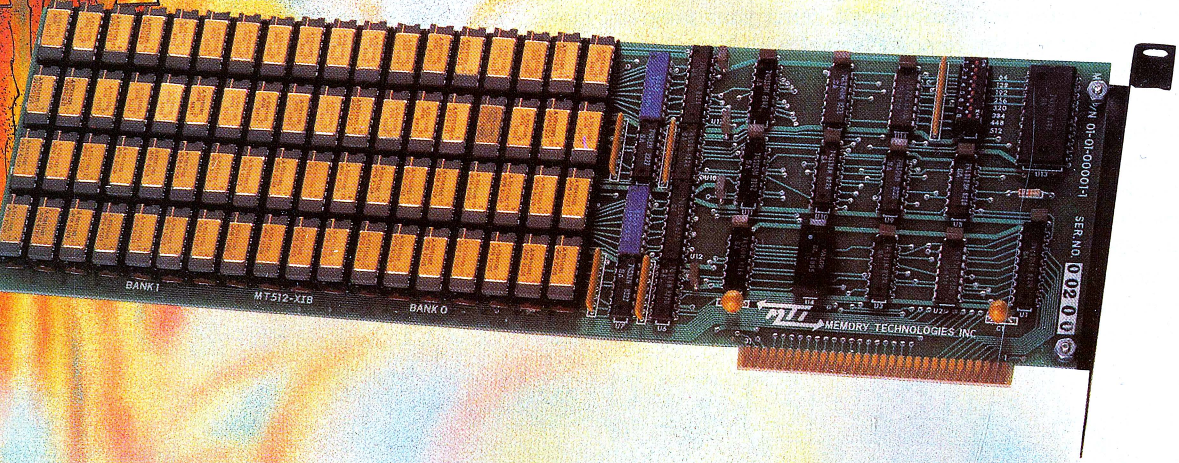

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```
           LENGTH2:               INTEGER;
           EDIT_EMPLOYEE1,
           EDIT_EMPLOYEE2,
           RESULT:                STRING(20);
    BEGIN  (*PROCEDURE EDIT*)
           (*Find length of unlimited STRINGs*)
           LENGTH1 := UPPER (EMPLOYEE1);
           LENGTH2 := UPPER (EMPLOYEE2);
           (*Test if lengths are within limits of target limited
             STRINGs*)
           IF LENGTH1 > 20 THEN
                BEGIN
                WRITELN ('NAME ',EMPLOYEE1,' IS
                             TOO LONG');
                RETURN
                END;
           IF LENGTH2 > 20 THEN
                BEGIN
                WRITELN ('NAME ',EMPLOYEE2,' IS
                             TOO LONG');
                RETURN
                END;
           (*Copy unlimited STRINGs to local limited
             STRINGs*)
           COPYSTR (EMPLOYEE1,EDIT_EMPLOYEE1);
           COPYSTR (EMPLOYEE2,EDIT_EMPLOYEE2);
           (*Continue processing with limited STRINGs*)
           IF  EDIT_EMPLOYEE1  <  EDIT_EMPLOYEE2
           THEN
                RESULT := EDIT_EMPLOYEE1
           ELSE
                RESULT := EDIT_EMPLOYEE2;
           WRITELN (RESULT,' COMES FIRST.');
    END;   (*PROCEDURE EDIT*)
```

This procedure uses two of the tools in the IBM Pascal library: the function *upper* and the procedure *copystr*. In general, the function *upper* returns the upper bound of an array, a set, an enumerated series, or a subrange type. If you use it with a limited *string* you will get the value of the *string*'s declared upper limit. In this case, with unlimited *strings*, *upper* gives us the length of the actual data in the *strings* received by the formal reference parameters Employee1 and Employee2.

We can then test each length to make sure it is within the bounds of the limited *string* we will use for comparison and assignment. If the length is too long (more than twenty characters), we write an error message using the unlimited *string* and then go back to the calling routine using the IBM Pascal word *return*.

If the unlimited *strings* pass the length test, we copy them to the local limited *strings* called Edit_Employee1 and Edit_Employee2 using the predeclared procedure *copystr* (for *copy string*). We have to use this special procedure instead of a simple assignment statement because assignments won't work with unlimited *strings*. Note that the syntax is the reverse of an assignment statement: the original *string* precedes the target *string*.

Now we can go on to treat the local limited *strings* just like our old friends, the global limited *strings* we met in the sample program Compare. We directly compare them to each other, use assignment statements to transfer values, and use a single *Writeln* statement to print one on the screen.

There is another use for the unlimited *string*, the *pointer referent*. The pointer referent *string* has a lot in common with its parent type, the super array, which allows you to do dynamic allocation of memory at program execution time. We'll discuss this topic in greater detail later in a follow-up article on super arrays. For now, let's turn our attention to the *string*'s close relative, the *lstring*.

Something New under the Sun. While the IBM Pascal *string* bears some resemblance to the UCSD *string*, the *lstring* is a new creature entirely. It's a variable-length string, closer in concept to the string variable in Basic than to a regular Pascal array. The *l* in *lstring* stands for the length of the actual data stored in the *lstring*, a value that appears in binary format in the first byte of the *lstring*. The closest thing to an *lstring* in Standard Pascal would be an array of characters, such as

```
    VAR LINE: PACKED ARRAY [0. .80] OF CHAR;
```

where the programmer would store the length of the line in Line[0] in the form *chr [length]*.

However, such a definition is not the true equivalent of an IBM Pascal *lstring*. With an *lstring*, Pascal keeps track of the length for you, and uses only enough memory to store the actual data. There is no padding with blanks to the declared limit of the array. To declare an *lstring* similar to the array Line above, you would write

```
    VAR LINE: LSTRING(80);
```

This is the common, garden-variety, limited *lstring*. Like the limited *string*, it requires a declaration of maximum length. An *lstring* can be up to 255 characters long. It has the advantage common to both the limited *string* and the unlimited *string* that you can read or write an *lstring* in one statement. But when you do, it behaves differently. Suppose we read the *lstring* called Line from the keyboard with the code

```
    READLN (LINE);
```

When we run the program the operator types in

Blaise Pascal was born in 1623.

The sentence is 31 characters long, so IBM Pascal will store the binary value of 31 in Line[0]. Bytes 1 to 31 of Line will contain data. There will be no trailing blanks to pad the *lstring* to its declared

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limit of 80. Its actual limit is now 31, and if you go beyond it, for example by writing Line[32], your program will crash.

Thus, it's important to keep track of the actual length of your *lstring* so that you don't exceed its limits. IBM Pascal allows the programmer two ways to examine an *lstring*'s length. One method translates the binary value in the *lstring*'s first byte into a regular numeric value. The following program illustrates how it's done.

```
PROGRAM LINELENGTH (INPUT,OUTPUT);
VAR
          LINE:                    LSTRING(80);
          TEMP_LENGTH:             CHAR;
          LENGTH:                  INTEGER;
BEGIN     (*PROGRAM LINELENGTH*)
          WRITELN ('ENTER A LINE.');
          READLN (LINE);
          (*Extract length stored in LINE[0]*)
          TEMP_LENGTH := LINE[0];
          (*Translate char value to integer*)
          LENGTH := ORD (TEMP_LENGTH);
          WRITELN ('LENGTH IS ',LENGTH)
END.      (*PROGRAM LINELENGTH*)
```

Because the *lstring* is an array of characters, IBM Pascal views the length value in the first byte as a character. Thus, we use a character variable, Temp_length, to extract the value stored in Line[0]. Then we use the familiar Standard Pascal function *ord* to translate Temp_length to the integer variable *Length*. If we were planning to manipulate the *lstring* further, we would use the variable *Length* for limit checking.

Word to the Wise. The second method for finding the length of an *lstring* uses Pascal record notation and gives the length in *word* format. *Word* is a special IBM Pascal data type that we will discuss more fully later in this series when covering numerical data. Right now we'll regard it simply as a numerical type similar to *integer*. You can use it as an index for an *lstring*, and perform arithmetic, but only with other *words*. Mixing with *integers* is not allowed.

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This method uses record notation because IBM Pascal regards *lstrings* as records as well as arrays. The length is a predeclared element, *len*, in the record. Let's modify our program Linelength to see how it's done.

```
PROGRAM LINELENGTH (INPUT,OUTPUT);
VAR
          LINE:                    LSTRING(80);
          LENGTH:                  WORD;
BEGIN     (*PROGRAM LINELENGTH*)
          WRITELN ('ENTER A LINE.');
          READLN (LINE);
          (*Move LEN to LENGTH*)
          LENGTH := LINE.LEN;
          WRITELN ('LENGTH IS ',LENGTH)
END.      (*PROGRAM LINELENGTH*)
```

As you can see, we separate Line and Len with a period, just as if we had defined Len as a component of a record named Line. But we don't bother with the formal definition; IBM Pascal does it for us. The *word* variable Length can now be used as the upper limit for an index to Line if we also define that index as a *word*.

As with limited *strings*, we can compare *lstrings* with each other and copy one *lstring* to another, but the rules are slightly different.

For comparisons, *lstrings* are more flexible than *strings*. You can compare any two *lstrings*, even if they have different maximum lengths. You can even compare two unlimited *lstrings*, which, like the unlimited *strings*, can exist as formal reference parameters or as pointer referents.

Assignments are more complicated. Although the IBM Pascal manual says that "any *lstring* can be assigned to any other *lstring* as long as the current length of the source string is not greater than the maximum length of the destination string," don't count on it. Although the compiler accepts code using the assignment operator := to move the contents of one *lstring* to another, when you run the program you will likely get garbage in your destination *lstring* and unpredictable runtime errors as well.

A safer alternative is to use the IBM Pascal procedure *copystr*. Because *copystr* does length checking, you must move the length stored in the first byte of your source *lstring* to the first byte of your destination *lstring* before you invoke *copystr*. For example, to move Line1 to Line2 the code would be

```
PROGRAM COPYIT (INPUT,OUTPUT);
VAR
          LINE1,
          LINE2:                   LSTRING(80);
BEGIN     (*PROGRAM COPYIT*)
          WRITELN ('ENTER A LINE.');
          READLN (LINE1);
          (*Move length from LINE1[0] to LINE2[0]*)
          LINE2[0] := LINE1[0];
          (*Copy LINE1 to LINE2*)
          COPYSTR (LINE1,LINE2);
          WRITELN ('LINE2 IS ',LINE2)
END.      (*PROGRAM COPYIT*)
```

Note that the assignment statement moving Line1[0] to Line2[0] comes before the call to procedure *copystr*. This kind of assignment must precede *copystr* when you are moving one *lstring* to another. However, omit this step if you are using *copystr* to move an *lstring* to a limited *string*. Just make sure that the target *string* is long enough to accommodate the source *lstring*.

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One final word on copying: *copystr* won't let you move a *string* to an *lstring*. Instead, use the IBM Pascal procedure *copylst*. It works just like *copystr*, but it's designed specifically for moving a *string* to an *lstring*.

Because of the complexity of comparing and assigning *lstrings*, you will probably want to stick with *strings* if your program deals mainly with fixed-length records and does a lot of comparisons and assignments, as in a sort routine.

Proof Is in the Text Processing. However, the *lstring* really proves its worth in programs that manipulate text, such as word-processing programs. Because text lines often have widely varying lengths, the *lstring* will save a lot of storage by allocating only enough memory to accommodate the actual data. In addition, IBM Pascal provides four *lstring specific intrinsics* procedures for text processing that work only with *lstrings*. These routines, when combined with four more *string* or *lstring intrinsics*, which work on both *strings* and *lstrings*, provide the IBM Pascal programmer with a powerful text-processing capability.

We've already looked at *copystr* and *copylst*, which copy *strings* and *lstrings*. The other routines that work only with *lstrings* are *concat*, *delete*, and *insert*. *Concat* (for *concatenation*) will add a *string* to the end of an *lstring*. *Delete* will remove characters from an *lstring*, and *insert* will add characters to an *lstring*. In addition, the three routines *positn*, *scaneq*, and *scanne* will find the location of a specified pattern in either a *string* or an *lstring*. The program Replace in figure 1 illustrates how they can solve a typical problem in text processing: how to find a string and replace it with another string.

The main program simply accepts the input *lstrings* from the keyboard and passes them to *procedure* Find_and_replace. This procedure shows how unlimited *lstrings* defined as formal reference parameters behave. Note first the similarities to unlimited *strings*. In the procedure declaration, the *lstrings* have the prefix *var* and have no maximum defined limit. However, unlike *string* parameters, *lstrings* cannot have the prefix *const*. Another limitation is that formal *lstring* parameters cannot accept *string* actual parameters, while formal *string* parameters can accept *lstrings*.

But there the limitations end. You can treat the incoming unlimited *lstrings* the same way you treat regular limited *lstrings*. You don't have to remember a whole different set of rules as you do with the unlimited *strings*.

To understand how Replace works, consider the following sample run.

Enter a line.
How now red cow.
Replace: red
With: brown
New line is :
How now brown cow.

After the main routine accepts the incoming *lstrings* and passes them to Find_and_replace, the first order of business is to determine the lengths of the incoming *lstrings* so that we can check for errors. Then we use the intrinsics function *positn*. The IBM Pascal manual defines the function as

FUNCTION POSITN (CONST P:STRING; CONST S:STRING; I: INTEGER): INTEGER

GOTO 101

```
PROGRAM REPLACE (INPUT,OUTPUT);
CONST
        LINE_LIMIT = 80;
VAR
        INPUT_LINE,
        INPUT_REPLACEMENT,
        INPUT_SEARCH_ARG:   LSTRING(LINE_LIMIT);
PROCEDURE FIND_AND_REPLACE (VAR LINE,REPLACEMENT,SEARCH_ARG: LSTRING);
CONST
        LINE_START = 1;
VAR
        FOUND:              BOOLEAN;
        TEMP_LENGTH:        CHAR;
        COL,
        HIGHEST_LINE_LENGTH,
        LINE_LENGTH,
        REPLACEMENT_LENGTH,
        SEARCH_ARG_LENGTH:   INTEGER;
BEGIN   (*FIND_AND_REPLACE*)
        (*Determine lengths of LSTRINGS*)
        TEMP_LENGTH := SEARCH_ARG[0];
        SEARCH_ARG_LENGTH := ORD (TEMP_LENGTH);
        TEMP_LENGTH := REPLACEMENT[0];
        REPLACEMENT_LENGTH := ORD (TEMP_LENGTH);
        (*Look for search argument in line*)
        COL := POSITN (SEARCH_ARG,LINE,LINE_START);
        FOUND := COL > 0;
        IF NOT FOUND THEN
                WRITELN ('String not found.')
        ELSE
                BEGIN
                DELETE (LINE,COL,SEARCH_ARG_LENGTH);
                TEMP_LENGTH := LINE[0];
                LINE_LENGTH := ORD (TEMP_LENGTH);
                HIGHEST_LINE_LENGTH := LINE_LENGTH + REPLACEMENT_LENGTH;
                IF HIGHEST_LINE_LENGTH > LINE_LIMIT THEN
                        WRITELN ('Replacement too long.')
                ELSE
                        BEGIN
                        (*Test if search argument was at the end of the LINE*)
                        IF COL > LINE_LENGTH THEN
                          CONCAT (LINE,REPLACEMENT)
                        ELSE
                          INSERT (REPLACEMENT,LINE,COL);
                        WRITELN ('New line is: ');
                        WRITELN (LINE);
                        END;
                END;
END;    (*FIND_AND_REPLACE*)
BEGIN   (*PROGRAM REPLACE*)
        (*Get line, search argument, and replacement*)
        WRITELN ('Enter a line.');
        READLN (INPUT_LINE);
        WRITE ('Replace: ');
        READLN (INPUT_SEARCH_ARG);
        WRITE ('With: ');
        READLN (INPUT_REPLACEMENT);
        (*Pass input to FIND_AND_REPLACE *)
        FIND_AND_REPLACE (INPUT_LINE,INPUT_REPLACEMENT, INPUT_SEARCH_ARG);
END.    (*PROGRAM REPLACE*)
```

Figure 1. Finding and replacing a string.

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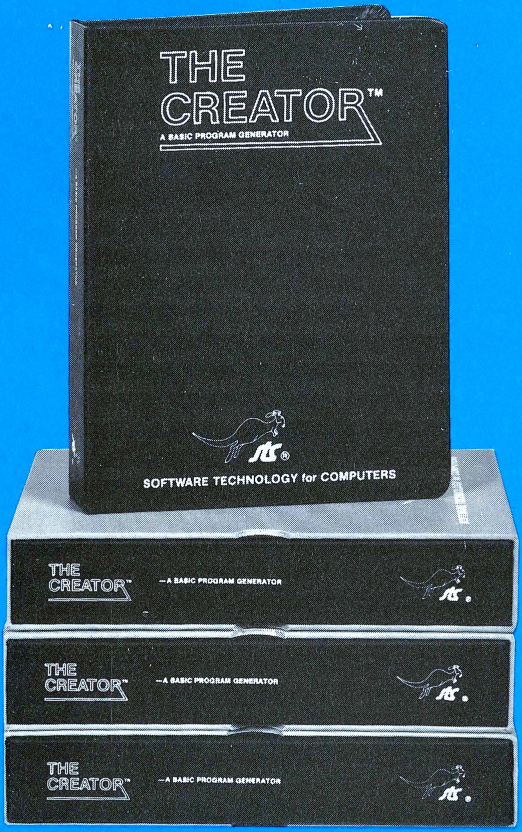

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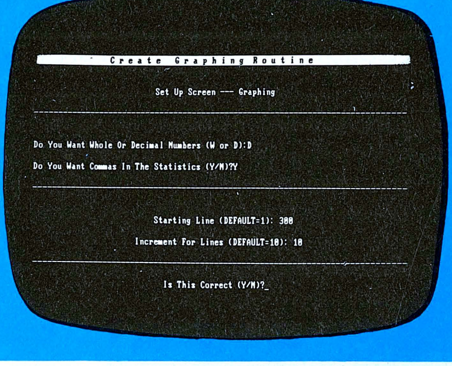
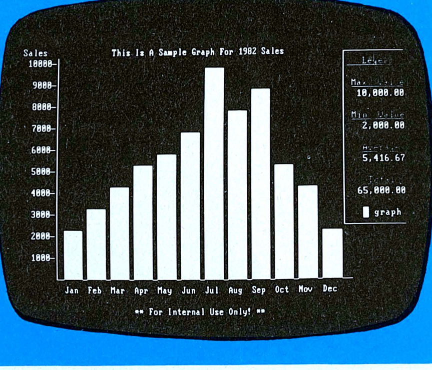


```
                      Create Graphing Routine

                   Set Up Screen --- Graphing
---------------------------------------------------------------

Do You Want Whole Or Decimal Numbers (W or D):D
Do You Want Commas In The Statistics (Y/N)?Y
---------------------------------------------------------------

                 Starting Line (DEFAULT=1): 300
              Increment For Lines (DEFAULT=10): 10
---------------------------------------------------------------

                      Is This Correct (Y/N)?_
```

FINISH



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from page 96

It looks for the pattern P in the string S beginning at S[I], returning the position of the pattern as an integer. Our code,

```
COL := POSITN (SEARCH_ARG,LINE,LINE_START),
```

will look for *red* in *How now red cow*, beginning with the first byte of the sentence, Line[line_start]. If Col is greater than 0, we have a hit. Otherwise, the search argument is not in the line, so we write an error message.

Since we do find *red*, *positn* assigns the value 9 to Col because *red* occurs in the ninth position of Line. The next step is to use the intrinsics procedure *delete*, defined as

```
PROCEDURE DELETE (VAR D:LSTRING; I,L:INTEGER)
```

This deletes L characters from the *lstring* D at the position D[I]. Because the search argument *red* is three characters long, our code

```
DELETE (LINE,COL,SEARCH_ARG_LENGTH)
```

will delete three characters from Line beginning at Line[9]. The new content of Line is now *How now cow*, with *now* and *cow* separated by two blanks.

Now we find the new length of Line, which is 11, and add it to 5, the length of the replacement string *brown* to form Highest_line_length. We need to compare this value to our original Line_limit of 80 to make sure we won't be out of bounds when adding our replacement string to the line. Even though *procedure* Find_and_replace is working with unlimited *lstrings*, Pascal will use the declared limit of the source *lstring* for limit checking. If you exceed the limit, your program will abort.

Before we add the replacement, we need to decide whether to use *insert* or *concat*. *Insert* works when you insert a string within a line. *Concat* works when you add a string to the end of a line. We do this by comparing Col, the position of the deleted search argument, with the new length of Line. If Col is greater than Line_length, we know we are at the end of the line, and use *concat*. Otherwise, we use *insert*.

Concat is very straightforward. In our code,

```
CONCAT (LINE,REPLACEMENT),
```

would simply tack Replacement onto the end of Line. *Insert* is only slightly more complicated. Our code,

```
INSERT (REPLACEMENT,LINE,COL),
```

inserts Replacement *brown* into Line starting just before Line[9], the position of the second blank preceding *cow*.

Our sample program does not cover the functions *scaneq* and *scanne*, which are very similar in operation to the function *positn*. Instead of searching for a string in a text, they search for a character. The definition of *scaneq* is

```
FUNCTION SCANEQ (L:INTEGER; P:CHAR; CONST
S:STRING; I: INTEGER): INTEGER
```

It returns the number of skipped characters, when scanning for the character P in the string S, beginning at S[I], continuing for L characters. If L is negative, the function will scan from right to left and return a negative number. It will return the L parameter if it doesn't find P. You will get a zero back if you tell it to start at an S[I] that is greater than the upper limit of S. This function can be very handy in finding blanks in a word-counting program.

The function *scanne* is almost identical, but it will stop scanning when it finds a character *not equal* to the character P. This could be useful in skipping blanks or special characters.

In Conclusion. This discussion has been an introduction to the IBM Pascal *strings* and *lstrings*, but the topic is by no means exhausted. We will cover other aspects of *strings* and *lstrings* in future articles, building on this base. In the meantime, with this background, you can incorporate *strings* and *lstrings* into your own programs and begin to bring Pascal into the microcomputer age. ▲

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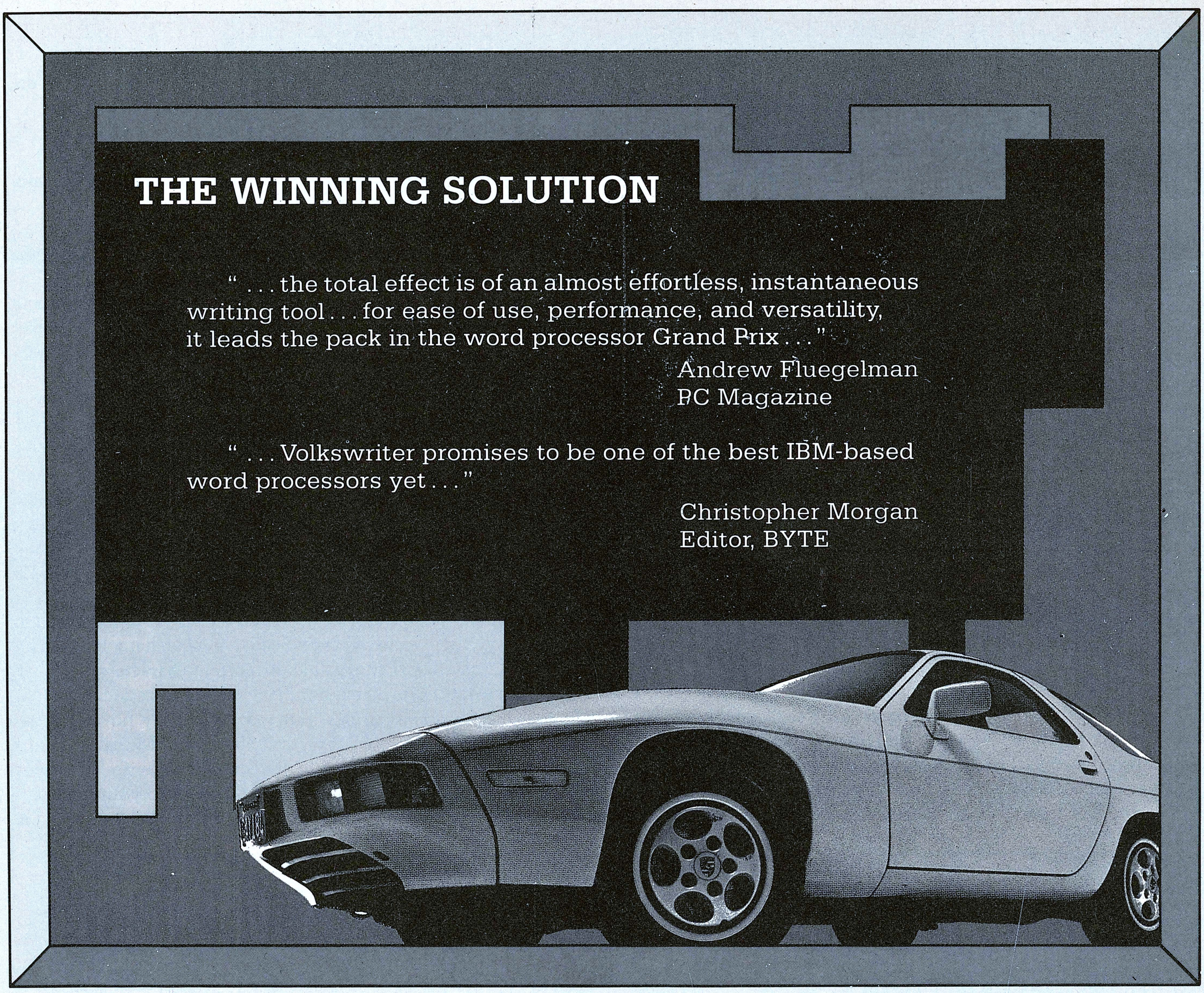

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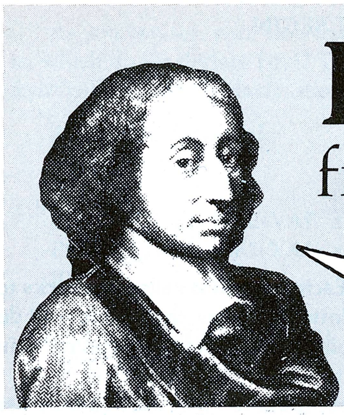

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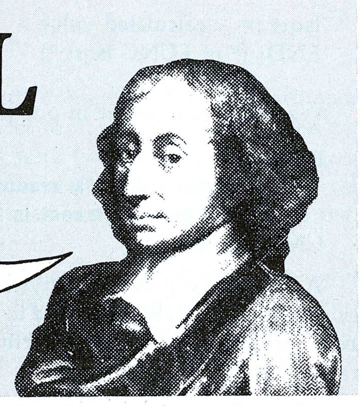

by Bruce F. Webster and Deirdre A. Wendt

Last month we looked at *subprograms*. A subprogram is like a regular Pascal program with three exceptions: it is declared within a program or subprogram; it can receive and return values (called *parameters*); and it can reference any identifiers belonging to the enclosing program and subprogram(s). We specifically talked about *procedures*, one of two types of subprograms. Here is a sample program with a simple procedure:

```
PROGRAM testswap;
VAR
  able,baker,charlie,dog : integer;
PROCEDURE swap(VAR val1,val2 : integer);
VAR
  temp                   : integer;
BEGIN
  temp := val1;
  val1 := val2;
  val2 := temp
END; (* of PROC swap *)
BEGIN (* main body of PROGRAM testswap *)
  able := 4; baker := 10; charlie := 3; dog := 421;
  swap(able,dog);
  swap(baker,able);
  swap(dog,charlie);
  swap(baker,dog);
  swap(able,charlie);
  swap(charlie,baker)
END. (* of PROG testswap *)
```

The first time *swap* is called, the integer variables *able* and *dog* are substituted for the formal parameters *val1* and *val2*. After that first call, *able* has a value of 421 and *dog* has a value of 4. The same swapping occurs during each of the other calls to *swap*. We leave you the exercise of figuring out the final values of *able*, *baker*, *charlie*, and *dog*.

Now on to new information. This month we'll cover *functions* (the other kind of subprograms), recursive calls, forward declarations, and other odds and ends. We'll also have a brief Pascal program demonstrating all the major features talked about so far.

Functions. As we've seen, a procedure can change the values of parameters passed to it. The calling program (or subprogram) can then use those modified parameters for whatever purpose it has. Suppose, for example, that we wrote a procedure to find the integer square root of a given value:

```
PROCEDURE isqrt(val : integer; VAR root : integer);
< declarations >
BEGIN
< statements >
END; (* of PROC isqrt *)
```

This procedure would take *val*, find its square root, and set *root* to that value. The calling program might use it as follows:

```
REPEAT
  write('Enter value: '); readln(able);
  isqrt(able,baker);
  writeln('The square root is ',baker)
UNTIL able = 0;
```

There are many other cases where we might want to do something similar—that is, return a value based on certain variables or conditions. After a while, it can get a little clumsy or tiring always to set aside one parameter for the returned value. So, instead, we can use a *function*. A function acts just like a procedure, but with one difference: it returns some scalar value (brief review: scalar data types include *integer*, *char*, *Boolean*, and any enumerated data type, of *EDT*). For example, we might rewrite *isqrt* as follows:

```
FUNCTION isqrt(val : integer) : integer;
< declarations >
BEGIN
< statements >
```

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```
  isqrt := < calculated value >
END; (* of FUNC isqrt *)
```

We could now use it in our program like this:

```
REPEAT
  write('Enter value: '); readln(able);
  writeln('The square root is ',isqrt(able))
UNTIL able = 0;
```

A function can be used anywhere that a constant or an expression of the same data type could be used. Suppose we wanted to find both the integer square and fourth roots of a given value. We could rewrite the program this way:

```
REPEAT
  write('Enter value: '); readln(able);
  writeln('The square root is ',isqrt(able));
  writeln('The fourth root is ',isqrt(isqrt(able))
UNTIL able = 0;
```

When you use a function, you must be sure that you have set it to some value before exiting. You do this by assigning some value to the function name. You must also be careful not to use the function name in any other way within the function itself. For example, the statement

```
isqrt := isqrt DIV 2;
```

would (or should) cause a compiler error. Why? Because Pascal considers the second use of *isqrt* in this statement to be another call to the function itself, and we don't have a parameter for it.

Can a function call itself? The answer follows.

Recursive subprograms. As mentioned last month, the Great Underlying Rule of Pascal is: no identifier (constant, data type, variable, or subprogram) may be used unless it has been previously declared in the main program or in an enclosing subprogram. The corollary is that all such identifiers *may* be used, which means that a subprogram can call itself.

For example, let's suppose we're writing a graphics package and want a procedure that fills a blank area on the screen. Let's also suppose that we've already written two other graphics subprograms: *plotxy(x,y)*, which plots a point at x,y; and *plotted(x,y)*, a Boolean function that returns *true* if the point x,y has been plotted and *false* otherwise. Here, then, is our procedure:

```
PROCEDURE fill(x,y : integer);
BEGIN
  IF NOT plotted(x,y) THEN BEGIN
    plotxy(x,y);
    fill(x+1,y);
    fill(x-1,y);
    fill(x,y+1);
    fill(x,y-1)
  END
END; (* of PROC fill *)
```

Can you see how this works? Each time *fill* is called, it checks to see if the location (x,y) has been plotted. If it has, then *fill* doesn't do anything. Otherwise, *fill* plots a point at (x,y) and then tries to fill in each of the four adjacent points to (x,y).

One caveat about recursive subprograms: they can quickly use up a lot of memory, causing your program to behave erratically or to blow up. We could easily come up with an example where *fill* would continue to call itself until we had over one hundred levels of nested subroutine calls, many systems just can't handle that many levels of nesting, so be careful.

Forward declarations. Are there any more situations where the Great Underlying Rule of Pascal gets in the way? Well, occasionally, we wish to call a subprogram before it has been declared, out of convenience or necessity. For example, we might have the following program:

```
PROGRAM example;
VAR
  alpha                    : integer;
PROCEDURE test1(VAR a : integer);
BEGIN
  a := a - 1;
  IF a > 0
    THEN test2(a)
END; (* of PROC test1 *)
PROCEDURE test2(VAR a : integer);
BEGIN
  a := a DIV 2;
  IF a > 0
    THEN test1(a)
END; (* of PROC test2 *)
BEGIN (* main body of PROGRAM example *)
  alpha := 15;
  test1 (alpha)
END. (* of PROG example *)
```

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As you can see, *test1* calls *test2*, and *test2* calls *test1*. The question is, which do we declare first? The answer: both. How? By declaring *test2* with a *forward* declaration:

```
PROGRAM example;
VAR
   alpha                        : integer;
PROCEDURE test2(VAR a : integer);                FORWARD;
PROCEDURE test1(VAR a : integer);
BEGIN
   . . .
END; (* of PROC test1 *)
PROCEDURE test2;
BEGIN
   . . .
END; (* of PROC test2 *)
BEGIN (* main body of PROGRAM example *)
   . . .
END. (* of PROG example *)
```

The *forward* declaration of *test2* contains only that information necessary to resolve any references to it, namely its name and parameter list. The actual body of *test2* (which, you will notice, no longer has a parameter list) occurs after *test1*. Now *test1* can call *test2* (because of the *forward* statement) and *test2* can call *test1* (since the latter precedes the former).

Sample program. Figure 1 shows a Pascal program with various subprograms. The program is a simple find-and-shoot-the enemy game. We didn't put in any *forward* declarations or recursive calls, but just about everything else we've discussed is in there (plus a few that we haven't, such as sets).

This ends, for now, our discussion of subprograms. Next month we'll start a two-part series on files: what they are, how you use them, and why they're so neat. See you then. ▲

```
PROGRAM example;
(*
            example:        sample program for IBM softalk
            last update:    28 February 1983
            language:       UCSD Pascal
            notes:          uses gotoxy and TYPE string
*)
CONST
  xmin                      =  0;
  xmax                      = 31;
  ymin                      =  0;
  ymax                      = 23;
  offset                    = 32; (* difference between 'A' and 'a' *)
TYPE
  xrange                    = xmin..xmax;
  yrange                    = ymin..ymax;
  setofchar                 = SET OF char;
  commandtype               = (quit,move,fire,search);
VAR
  x1,y1,x2,y2               : integer;
  command                   : commandtype;
  seed                      : real;
(* ------------ procedures and functions ----------- *)
PROCEDURE clearline(y : integer);
(*
            clears indicated line
*)
VAR
  indx                      : integer;
BEGIN
  gotoxy(0,y);
  FOR indx := 1 TO 80 DO
    write(' ');
  gotoxy(0,y)
END; (* of PROC clearline *)
PROCEDURE clearscreen;
(*
            clears entire screen
*)
VAR
  indx                      : integer;
BEGIN
  FOR indx := 0 TO 23 DO
    clearline(indx);
  gotoxy(0;0)
END; (* of PROC clearscreen *)
FUNCTION random : real;
(*
  returns "random" value between 0 and 1
*)
CONST
  multiplier                = 997;
BEGIN
  seed := seed * multiplier;
  seed := seed - trunc(seed);
  random := seed
END; (* of FUNC random *)
FUNCTION rand(low,high : integer) : integer;
(*
            returns pseudorandom value between low
            and high, inclusive  *)
VAR
  range,temp                : integer;
BEGIN
  IF high < low THEN BEGIN
    temp := high;
    high := low;
    low := temp
  END;
  range := (high - low) + 1;
  rand := low + trunc(random*range) (* int is Pascal function *)
END; (* of FUNC rand *)
PROCEDURE getchar(VAR ch : char; msg : string; okset : setofchar);
BEGIN
  clearline(0);
  REPEAT
    gotoxy(0,0); write(msg);
    read(ch);
    If ch >= 'a'                (* convert to upper case *)
      THEN ch := chr(ord(ch) - offset)
  UNTIL ch IN okset
END; (* of PROC getchar *)
PROCEDURE getcommand(VAR cmd : commandtype);
(*
            writes message, reads character, converts to command
*)
VAR
  ch                        : char;
BEGIN
  getchar(ch,'COMMAND > M)ove, F)ire, S)earch,
    Q)uit: ',['M','F','S','Q']);
    CASE ch OF
      'M' : cmd := move;
      'F' : cmd := fire;
      'S' : cmd := search;
      'Q' :cmd := quit
    END
 END; (* of PROC getcommand *)
 PROCEDURE initialize;
 BEGIN
   write('enter seed (real fraction): '); readln(seed);
   clearscreen;
   x1 := (xmax + xmin) DIV 2;
   y1 := ymin;
   x2 := (xmax + xmin) DIV 2 + rand(-5,5);
   y2 := (ymax + ymin) DIV 2 + rand(-5,5);
 END; (* of PROC initialize *)
 PROCEDURE updateposition(VAR x,y : integer; dx,dy : integer);
 (*
            purpose:        updates x and y
 *)
   PROCEDURE wraparound(min : integer; VAR val : integer;
                  max : integer);
   (*       purpose:        handles wrap around cases
   *)
   BEGIN
     IF val < min
       THEN val := max
     ELSE IF val > max
       THEN val := min
   END; (* of PROC wraparound *)
 BEGIN (* main body of PROC updateposition *)
   x := x + dx;
   y := y + dy;
   wraparound(xmin,x,xmax);
   wraparound(ymin,y,ymax)
 END; (* of PROC updateposition *)
 PROCEDURE moveother;
 (*
            move enemy about 50% of the time
 *)
 BEGIN
   IF rand(1,2) = 1
     THEN updateposition(x2,y2,rand(-1,1),rand(-1,1))
 END; (* of PROC moveother *)
 PROCEDURE domove;
 (*
            allows player to move
 *)
 VAR
   ch                       : char;
   dx,dy                    : integer;
 BEGIN
   dx := 0; dy := 0;
   getchar(ch,'MOVE > U)p, D)own, L)eft, R)ight: ',['U','D','L','R']);
   CASE ch OF
     'U' : dy :=  1;
     'D' : dy := -1;
     'L' : dx := -1;
     'R' : dx :=  1
   END;
   updateposition(x1,y1,dx,dy);
   gotoxy(0,4); write('Current location: ',x1:3,',',y1:3)
 END; (* of PROC move *)
 PROCEDURE dosearch;
 (*
            searches for enemy in adjacent/same locations
 *)
 VAR
   found                    : Boolean;
   dx,dy,tx,ty              : integer;
 BEGIN
   found := false;
   dx := - 3;
   WHILE NOT found AND (dx < 4) DO BEGIN
     dy := - 3;
     WHILE NOT found AND (dy < 4) DO BEGIN
       tx := x1; ty := y1;
       updateposition(tx,ty,dx,dy);
       IF (tx = x2) AND (ty = y2)
         THEN found := true
         ELSE dy := dy + 1
     END;
     IF NOT found
       THEN dx := dx + 1
   END;
   clearline(1);
   IF found THEN BEGIN
     gotoxy(0,1); write('Enemy spotted: current location is ');
     IF (dx = 0) AND (dy = 0)
       THEN write('same as yours')
    ELSE BEGIN
      IF dx < 0
        THEN write('to the left of')
      ELSE IF dx > 0
        THEN write('to the right of');
      IF (dx <> 0) AND (dy <> 0)
        THEN write(' and ');
      IF dy < 0
        THEN write('below')
      ELSE IF dy > 0
        THEN write('above');
         write(' yours')
       END
     END
     ELSE write('Enemy not spotted')
   END; (* of PROC dosearch *)
   PROCEDURE dofire;
   (*
            allows player to fire at enemy
   *)
   VAR
     ch                     : char;
     dx,dy                  : integer;
   BEGIN
     getchar(ch,'FIRE > Direction: L)eft, R)ight, U)p, D)own, S)ame: ',
            ['L','R','U','D','S']);
     dx := 0; dy := 0;
     CASE ch OF
       'L' : dx := -1;
       'R' : dx :=  1;
       'U' : dy :=  1;
       'D' : dy := -1
     END;
     clearline(2);
     IF (ch = 'S') AND (rand(1,4) = 1) THEN BEGIN
       gotoxy(0,2);
       write('Oops. . .you shot yourself! You lose!');
       command := quit
     END
     ELSE IF (x1+dx = x2) AND (y1+dy = y2) AND (rand(1,2) = 1)
        THEN BEGIN
       gotoxy(0,2);
       write('You got him!! You win!!');
       command := quit
     END
     ELSE BEGIN
       gotoxy(0,2);
       write('You missed. Better luck next time. ')
     END
   END; (* of PROC dofire *)
   (* -------- main body of PROGRAM example -------- *)
   BEGIN
     initialize;
     REPEAT
       getcommand(command);
       CASE command OF
         move         : domove;
         fire         : dofire;
         search       : dosearch
       END;
       moveother
     UNTIL command = quit
   END. (* of PROG example *)
```

Figure 1.

IF... THEN... MAYBE

PUTTING DOWN COMPUTER SNOBS

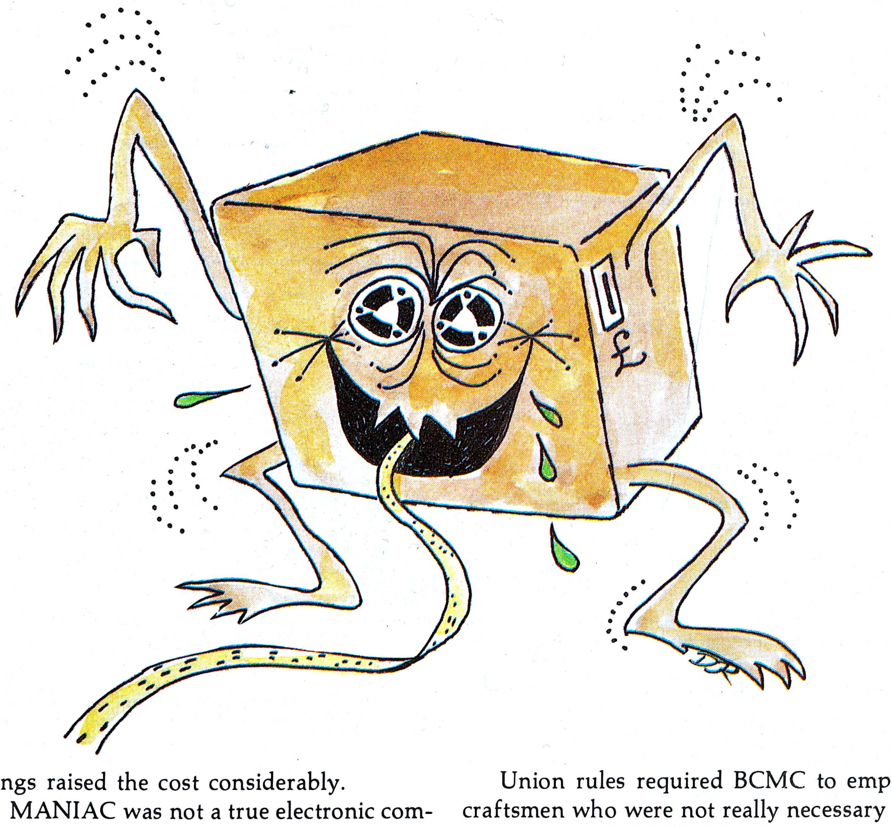
by Forrest Johnson

Are you a victim of computer snobbery? It happens like this: You are telling the gang at the office about your computer, and one says, "Yeah, my first computer was a TRS-80 Model I, Level I. It had 4K of memory." Maybe someone else one-ups him by saying, "I had an Altair. It had 4K and you had to put it together from a kit." There may even be a rare and envied person present who says, "I had an Apple I. It had 4K and Woz hand-assembled it himself!"

What can you do? Your machine is a hundred times better than any of those obsolete pieces of junk, but nobody cares about that. They're ignoring you, talking about cassettes and acid-core solder.

There is only one way to deal with computer snobs. Fight back! Tell lies! For the price of a few, innocent falsehoods, you can become the tackiest of hackers, the one-time owner of the junkiest computer of all. When someone says, "I never heard of it," tell him, "I'm not surprised. This was in the *old* days." If someone asks to see your antique, just tell him, "The bearings all wore out," or, "It melted down in an electric storm." No one will be the wiser.

To help you along, here are some good computers you can try out on your local computer snob. We guarantee he's never heard of them!



Illustrations by Don Robertson

MANIAC
by the British Coin Machine Company

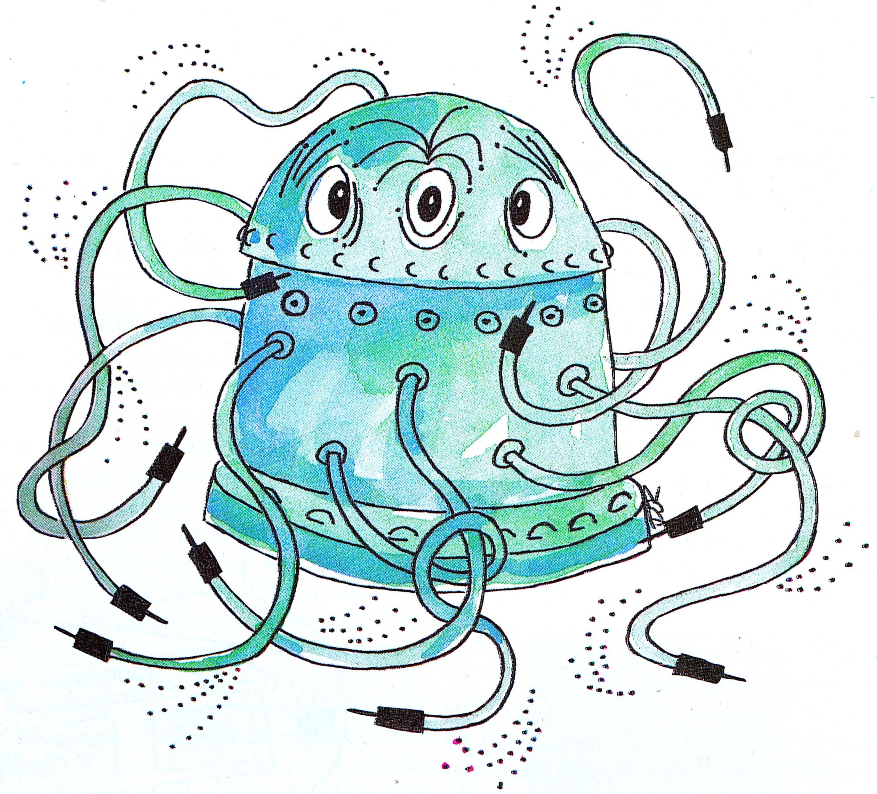
MANIAC (the Micro Algorithmic Numerical Integrator And Calculator) debuted in 1948. It was the smallest and cheapest computer of its period, occupying no more space than an ordinary dinner table and priced at only twenty-five thousand pounds. It did require a special power supply, air conditioner, and dehumidifier, and these things raised the cost considerably.

MANIAC was not a true electronic computer; it was an electromechanical device, rather like an old-fashioned cash register or pinball machine. You fed a paper tape, punched with binary code, in one side and then tried to read the results, also on tape in binary code, as they came out on the other side. Since the machine had no memory, the output tape simply represented the input figures modified according to a complicated algorithm you had keyed in using reverse Polish notation. The name MANIAC seems ironic when one considers the number of operators who eventually were committed to mental hospitals.

Union rules required BCMC to employ craftsmen who were not really necessary for the project. To keep them busy, the company added an extra feature, unique to computing. The machine included a slot where you had to deposit a British shilling before performing any computation. (Export versions included a supply of British shillings that could be reused.)

A MANIAC in operation was quite a spectacle, whirring, clicking, and buzzing, the operator trying to decode the tape as it spewed out at the prodigious pace of ten characters a minute. Frequently, the operator would pause to splice the tape, rekey errors, drop in another British shilling, or scream and kick the machine. "Operator damage" became a serious problem. At various times, enraged MANIAC operators vandalized their computers with axes, sledgehammers, battery acid, and by putting chewing gum in the tape feed. Even Lloyds of London refused to insure the machine.

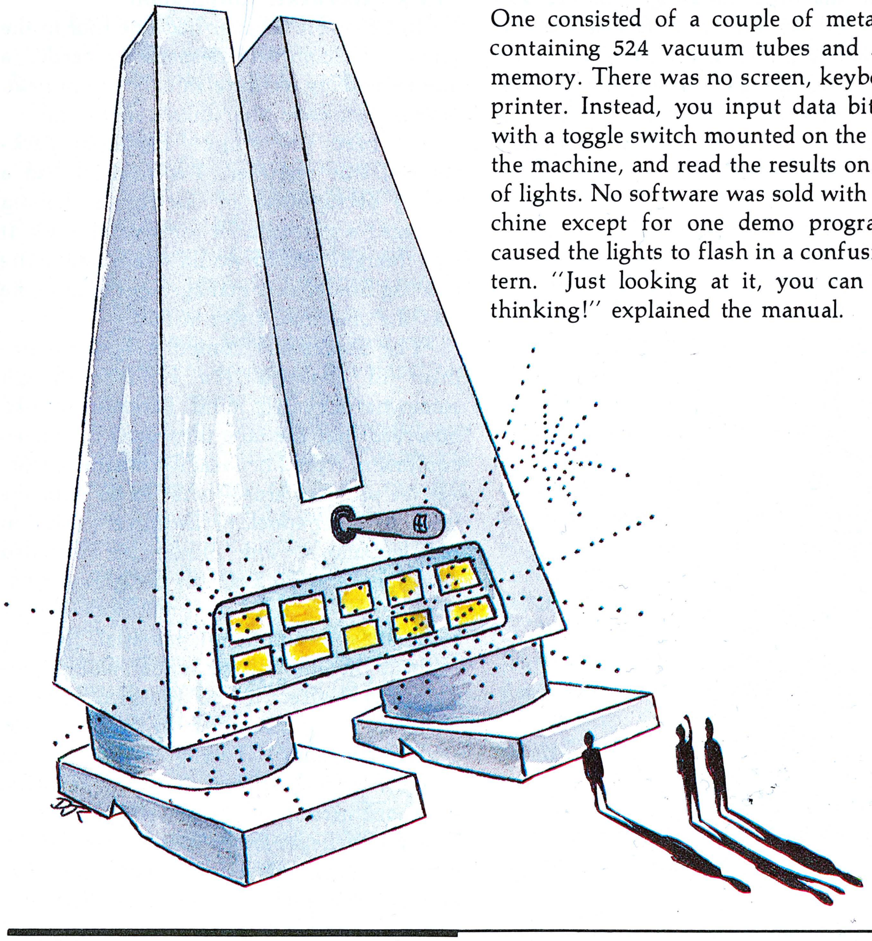
Despite these problems, both BCMC and its MANIACs remained in operation for many years. To protect jobs, the Labour government nationalized BCMC in 1950. It kept the assembly lines running long after the machine had ceased to be competitive. (Actually, it is doubtful whether MANIAC was ever competitive, but for a few years it had no competition.) People who had been unwise enough to purchase a MANIAC were reluctant to throw it out before they had paid for it, and that took a while. As late as the mid-seventies, a MANIAC was in use in the data processing department of the Franklin Bank of New York.



Computer One
by the Brontosaurus Corporation

The first electronic microcomputer, Computer One was announced in 1954 to an orchestra of publicity. "Now you can be the first on your block to own a computer—and for less than the price of your house!" Actually, at the time it was possible to buy a substantial house for less than $18,000, and the price was probably a factor in the machine's disappointing sales.

Although years of design work went into Computer One, delays in production resulted in hardware considered antiquated even at the time of manufacture. Computer One consisted of a couple of metal boxes containing 524 vacuum tubes and .04K of memory. There was no screen, keyboard, or printer. Instead, you input data bit by bit with a toggle switch mounted on the front of the machine, and read the results on a panel of lights. No software was sold with the machine except for one demo program that caused the lights to flash in a confusing pattern. "Just looking at it, you can tell it's thinking!" explained the manual.



The outlook for Computer One seemed to improve in 1955 when the town of Volga, South Dakota, announced its intent to buy one to control its traffic lights. Unfortunately for the Volgans, it was quickly discovered that (1) the computer couldn't control both traffic lights at the same time and (2) the tubes burned out an average of one every three hours.

Brontosaurus abandoned plans for a Computer Two later that year.

The Octopus Computer
by Octopus Computers

"Bring the power of the transistor revolution to your own home!" the ads trumpeted in 1958. For a fact, the Octopus Computer was the first transistor microcomputer ever manufactured. It was also the first analog microcomputer (and the last).

A first glance at the Octopus tended to confirm the impression its name created. On second glance, it still looked like a nasty tangle of cables. The Octopus had no memory. It was "programmed" by snaking cables from one bank of controls to another.

If, for example, you wanted to compute $(a+b)/c$, you took the cable from the two knobs labeled A and plugged it into the addition socket above the B knobs. You then plugged the B cable into the C division socket and ran the C cable to the output device—a bank of dials. You could then set *a*, *b*, and *c* to any values you chose and read the result on the output device.

According to an article in the February 1959 issue of *Electronic Hobby* magazine, the

Octopus couldn't handle numbers of more than two digits. Its answers often varied by 10 percent "and the deviation is compounded by fluctuations in current and room temperature." In a strongly worded reply, Octopus said the average home user didn't need more than two digits, and a "properly calibrated" computer seldom varied more than 3 or 4 percent. Nevertheless, these features made the machine unhandy for balancing a checkbook.

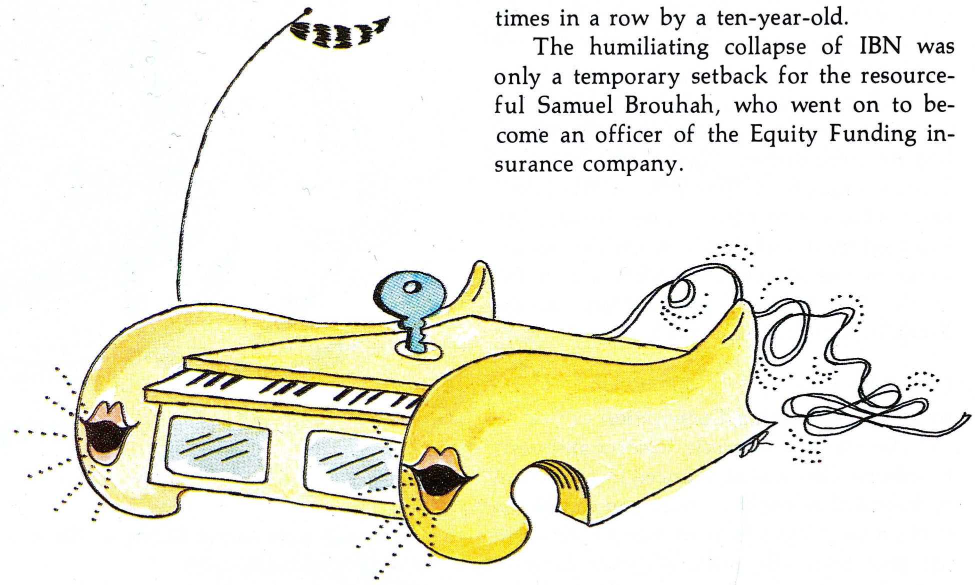
Octopus Computers filed for bankruptcy late in 1959. Industry observers put less blame on the computer, which was ahead of its (and anyone's) time, than on the company pricing policy. The Octopus computer sold for $2,500. The parts cost the company $3,200. Transistors were expensive in those days. Octopus had hoped to make up the difference with volume sales, but these, in any case, never materialized.

The IBN Computer
by International Business Notions

In an interview granted in 1960, IBN President Samuel Brouhah denied that he had named IBN in order to profit from confusion with another computer company. (In a fraud suit filed in 1961, he denied any connection with IBN. In the appeal of a perjury case in 1964, he denied he was Samuel Brouhah.)

Whatever the source of the name, the IBN computer did look a lot like a scaled-down mainframe. Basically it consisted of a bunch of printed circuit boards in an impressive-looking gray case with lots of mysterious lights and switches on the front. (After a careful reading of the owner's manual, many of these lights and switches remained mysterious.)

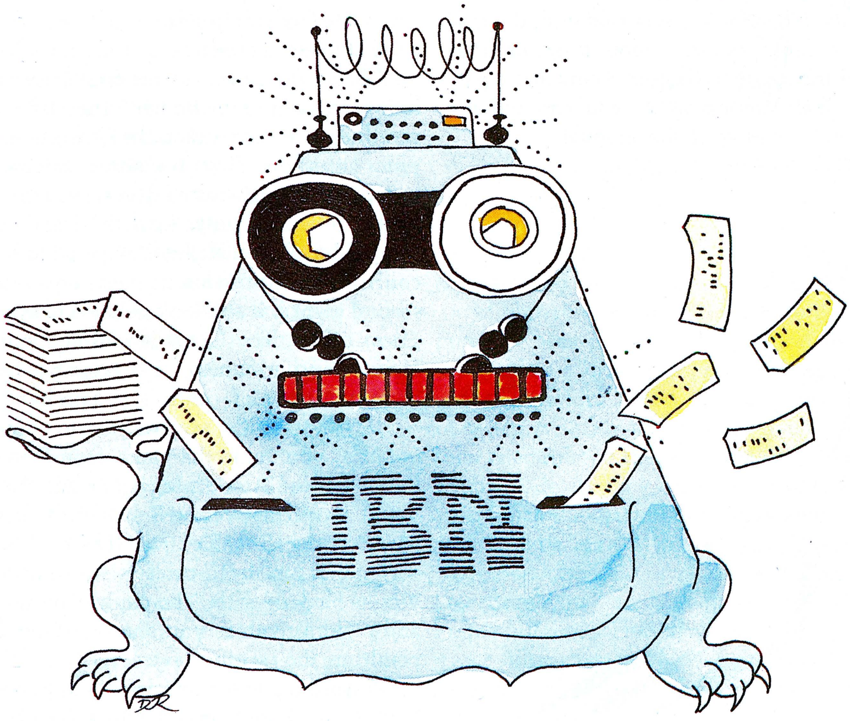
Surprisingly, this expensive-looking product was advertised as selling for "under $2,000." In fact, it sold for $1,999.95. The ads did not mention that the "optional" card reader, necessary for input, was $5,000. The "optional" card punch, necessary for input *or* output, was $8,000. "Expansion boards" for "advanced functions," like input and output, cost an additional $3,000.



The IBN computer could be programmed only in machine language, laboriously punched bit by bit on ninety-six-column cards. Having punched a stack of cards, the operator fed them one by one into the card reader. Eventually, a new stack (also punched bit by bit in machine language) would emerge on the card punch. In the meanwhile, you could sit and stare at all the lights and switches, without much hope of understanding or controlling what was going on inside.

The high point for IBN came at 8:00 p.m. on April 1, 1961, when the machine demonstrated a ticktacktoe program on live television. The low point came a few minutes later, after it had been defeated four times in a row by a ten-year-old.

The humiliating collapse of IBN was only a temporary setback for the resourceful Samuel Brouhah, who went on to become an officer of the Equity Funding insurance company.



The Studebaker Stereophonic Computer
by the Studebaker Corporation

In 1965, Studebaker had one foot in the grave. The company desperately needed a money-making venture in a hot new field. Nothing looked hotter than computers.

To head the project, Benjamin Parksquirrel was recruited. Parksquirrel had a strong background in electronics, having managed a stereo outlet for several years. It was thought that he would relate well to the existing Studebaker management because he was the chairman's son-in-law.

The Studebaker computer bore the imprint of Parksquirrel's brilliant though somewhat eccentric mind. Parksquirrel had observed that the tape then used for stereo equipment would be ideal for magnetic storage. A problem arose—what to do with the extra stereo channel. Parksquirrel's solution was ingenious. The Studebaker included dual speakers. To keep the design symmetrical, it also included dual monitors. (In the company's promotional material, it was claimed that the two monitors would produce a 3-D effect if you squinted at them. The only thing this verifiably produced was severe eyestrain.) Taking things a step further, Parksquirrel insisted on a piano keyboard instead of a typewriter keyboard. The piano keyboard was ideal for music-synthesis programs, but less useful for other applications, such as word processing. To top things off, the tape players, which Parksquirrel had obtained at discount from a South Korean supplier, tended to bury the floor in tape when you pushed the rewind key.

Over Parksquirrel's protests, the management of Studebaker injected some conservative elements into the design. To take advantage of existing facilities, it was decided the computer would have a streamlined body made of sheet metal with enamel paint and chrome trim. Instead of a regular on/off switch, it would have an ignition key. All this combined to give the computer a grotesque appearance. "I don't know whether I should play the Toccata and Fugue in D Minor, drive it around the block, or just give the thing a decent burial," one prospective customer said.

Though it had many novel elements, the Studebaker Stereophonic Computer was unsatisfactory from almost every point of view. Because of the dual monitors, most buyers preferred to use a display from a different manufacturer. Because of the piano keyboard, most preferred a keyboard from a different manufacturer. Because of the rewind problem, most preferred a tape machine from a different manufacturer. All in all, most owners wished they had bought a computer from a different manufacturer.

The Garakuta Computer
by Yasui-Kuzu

The invention of the microprocessor opened a door for microcomputer design, but for years only a few companies were bold enough to step through. One that did was Yasui-Kuzu, a subsidiary of the mammoth Moekiru Electronics company. Yasui-Kuzu was perhaps not the best company to design and manufacture a microcomputer, since its specialty was marine electronics and navigation aids. However, the computer division of Moekiru had recently been given a contract for a new sonar buoy, and the directors felt it was necessary to compensate Yasui-Kuzu for the loss of face.

Senior Engineer Toshi Sakanakao was appointed director of research. Sakanakao was a *very* senior, some say senile, engineer, but he had been one of the pioneers of Japanese marine electronics, and Yasui-Kuzu officials felt that his name would add prestige to the whole endeavor. After eight months of intense effort, Sakanakao surprised everyone by producing a working model for a combination calculator/depth finder.

This put Yasui-Kuzu in an awkward position. The company could not admit to making an error, and it certainly could not insult Sakanakao by rejecting his design. There was no market for a combination calculator/depth finder. To save face all around, Yasui-Kuzu ceremoniously accepted the design, then retired Sakanakao and hired a younger engineer for "minor preproduction revisions."

The young engineer, whose name is not recorded, did a creditable job, considering the obstacles. He had only a short time to design a microcomputer from scratch. Japanese import restrictions and Moekiru company policies limited his choice of components to Japanese products in general and Moekiru products in particular. These factors contributed much to the novelty of the design. The Garakuta (sometimes pronounced "barracuda") had a circular display, unusual for computers but routine for Japanese marine navigation instruments. It included large numbers of carbon resistors, rarely seen in computers, but commonplace for many electronic devices, such as ship-to-shore radios (for which it is assumed that no one minds a little current fluctuation).

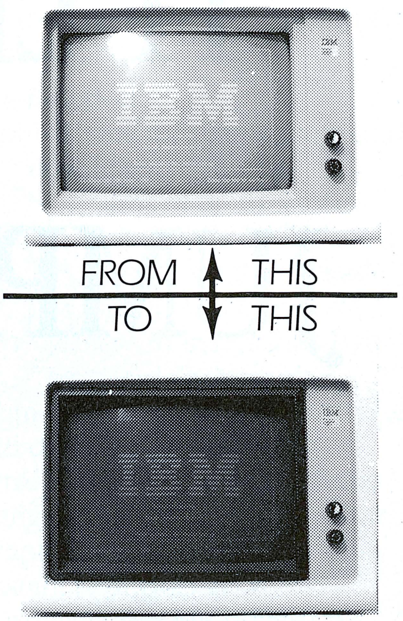
The most peculiar feature was the Orokana-omocha, an abacus-based microprocessor. Though obscure to Westerners, the Orokana-omocha seemed perfectly natural to the Japanese. Each byte corresponded to a rod on an abacus. In ordinary binary notation, each byte could represent only values from 0 to 255, but in abacus notation it could represent any number from 0 to 9. ("Much less confusing," the documentation pointed out.) In addition to this "advantage," Moekiru boasted the Orokana-omocha could outperform any conventional microprocessor. This claim was based on a 1946 experiment in which an abacus defeated an electric calculator in public competition.

Having produced the Garakuta, Yasui-Kuzu immediately tried to market it in the United States. This strategy was based less on the hardware (not exactly ideal for American users) than on Japanese export subsidies, which made it cheaper to ship the product from Osaka to New York than from Osaka to Tokyo. Anyway, English-speaking Garakuta owners reported difficulty in mastering Orokana-omocha assembler or even the simpler Tawagoto programming language, in which, for example, *ni-o-tsumu* corresponded to the command *load*. Americans resented having to begin every command with a polite *denshi-keisan-ki-san*. Also, there was no software available except for a *Star Trek*-type game called *Galaxy Blow-Up*.

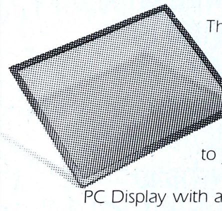
International complications aside, the Garakuta was never very popular even in Japan, where one frustrated owner was heard to exclaim, "Ni-yen-no-de, Artair kau-no-da-ga!" ("For two yen, I'd get an Altair!")

Had enough? We hope not! Turn to page 2 and learn how to win a hundred dollars in computer products by inventing your own snob computer. ▲

FAST PAIN RELIEF



The **SDC ANTIGLARE SCREEN** eliminates the eyestrain caused by reflections and improves the contrast of the display **without reducing brightness.**



The ANTIGLARE SCREEN is a tightly woven mesh which passes text and graphics through unimpeded, but won't reflect room light back to you. It mounts neatly in the recessed area of the PC Display with adhesive foam tape (inc.)

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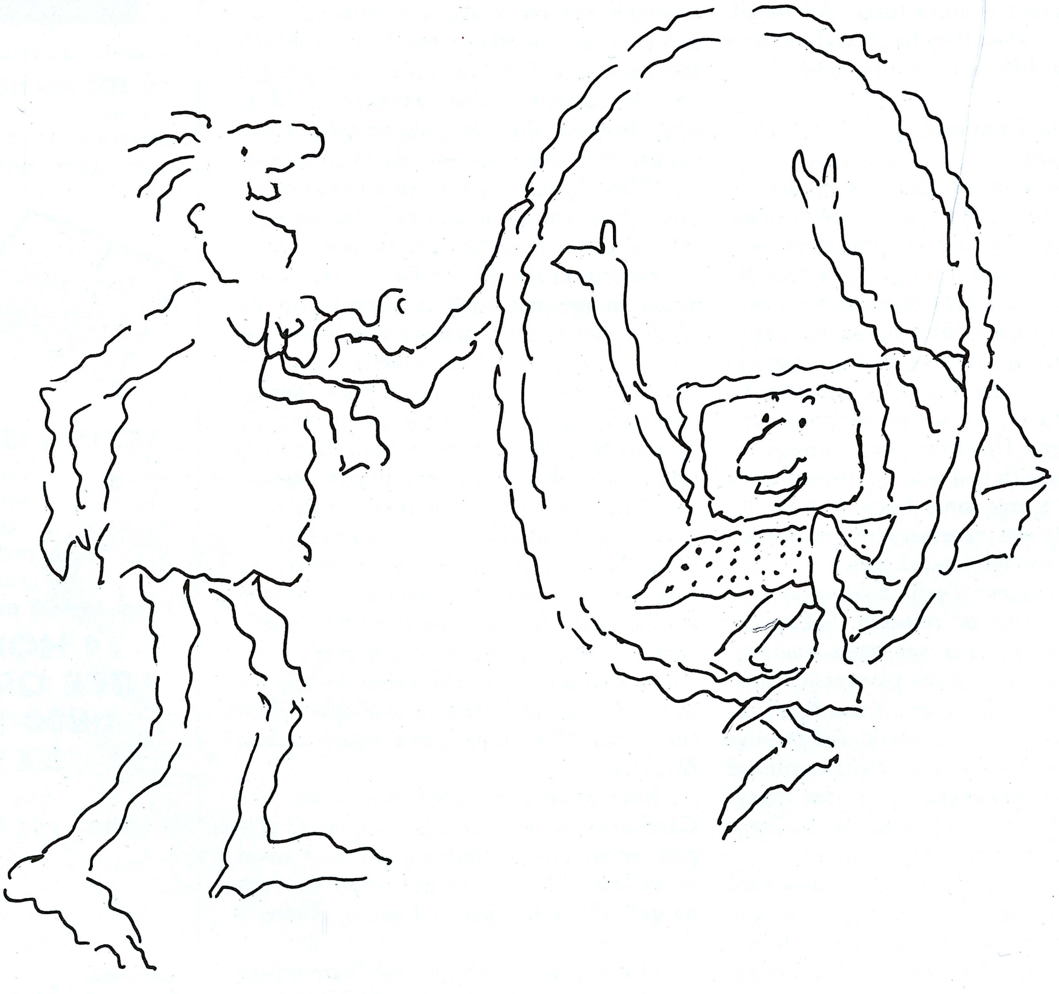
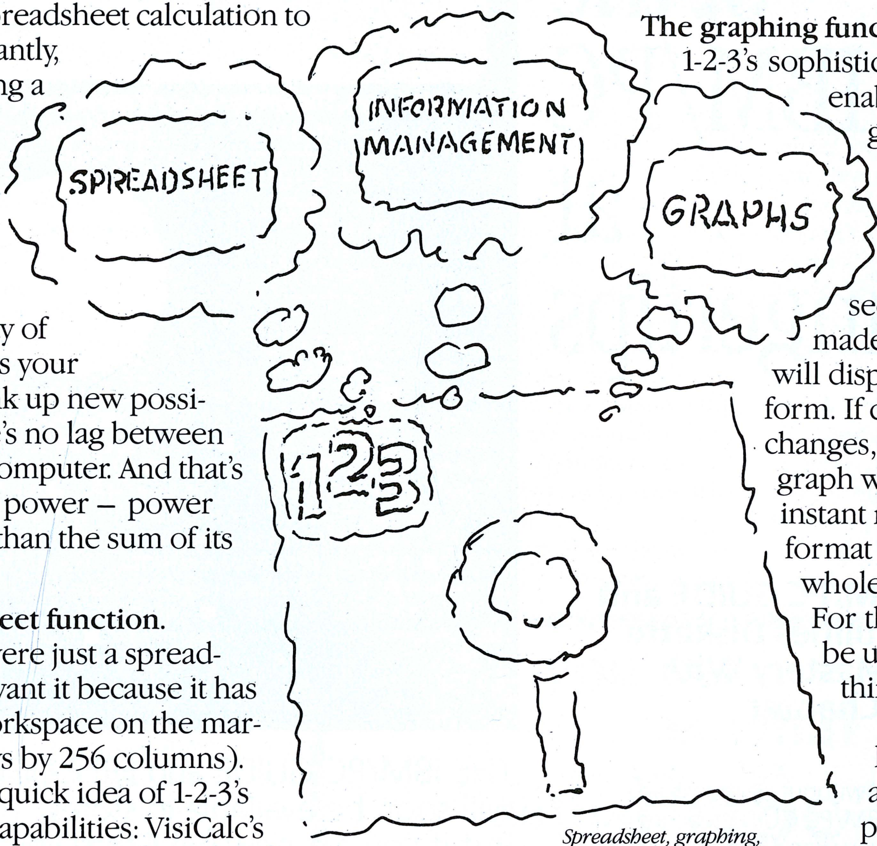
INTRODUCING 1-2-3.™ IT'LL HAVE YOUR IBM/PC JUMPING THROUGH HOOPS.



Meet 1-2-3 – the remarkable new software package that puts more raw power at your fingertips than anything yet created for the IBM PC. 1-2-3 actually combines information management, spreadsheet, and graphing in one program that can perform all three functions interchangeably and instantly at the touch of a key. That's power.

To explain: since 1-2-3's information management, spreadsheet and graphing functions reside in memory simultaneously, you can go from retrieval to spreadsheet calculation to graphing instantly, just by pressing a few keys. So now you can experiment and recalculate and look at data in an endless variety of ways. As fast as your mind can think up new possibilities. There's no lag between you and the computer. And that's a new kind of power – power that's greater than the sum of its programs.



Spreadsheet, graphing, information management all-in-one.

The spreadsheet function.

If 1-2-3 were just a spreadsheet, you'd want it because it has the largest workspace on the market (2048 rows by 256 columns). To give you a quick idea of 1-2-3's spreadsheet capabilities: VisiCalc's spreadsheet for the IBM PC offers 15 arithmetic, logical and relational operators, 28 functions and 32 spreadsheet-related commands. 1-2-3 has 15 operators, 41 functions and 66 commands. And if you include data base and graphing commands, it actually has 110!

In addition, 1-2-3 is up to 50 times as fast as established spreadsheets. With all the features you've ever seen on spreadsheets. 1-2-3 also gives you the capability to develop customized applications (with 26 macro keys) and lets you perform repetitive tasks automatically with one keystroke. If 1-2-3 were just a spreadsheet, it would be a very powerful tool. But it's much, much more.

The information management function.

Add to 1-2-3's spreadsheet a selective information management function, and the power curve rises at an awesome rate. Particularly since 1-2-3's information management capability reads files from other programs such as WordStar, VisiCalc and dBase II. So you can accumulate information on a limitless variety of topics and extract all or pieces of it for instant spreadsheet analysis. Unheard of before. Specific 1-2-3 information management features include sorting with primary and secondary keys. Retrieval using up to 32 criteria. 1-2-3 performs statistical functions such as mean, count, standard deviation and variance. It can produce histograms on part or all of the data base. 1-2-3 also allows for the maintenance of multiple data bases and multiple criteria.

The graphing function.

1-2-3's sophisticated graphing commands enable you to create graphs of up to six variables using information already on the spreadsheet. And have it on screen in less than two seconds! Once you've made a graph, three keystrokes will display it in a different form. If data on the spreadsheet changes, you can display a revised graph with one keystroke. This instant relationship of one format to another opens up a whole new application area. For the first time graphics can be used as a "what if" thinking tool!

To fully understand just how much power 1-2-3 adds to the personal computer you'll want to go to your nearby 1-2-3 dealer for a full demonstration. For his name and address (and more information if you want it) call 1-800-343-5414.

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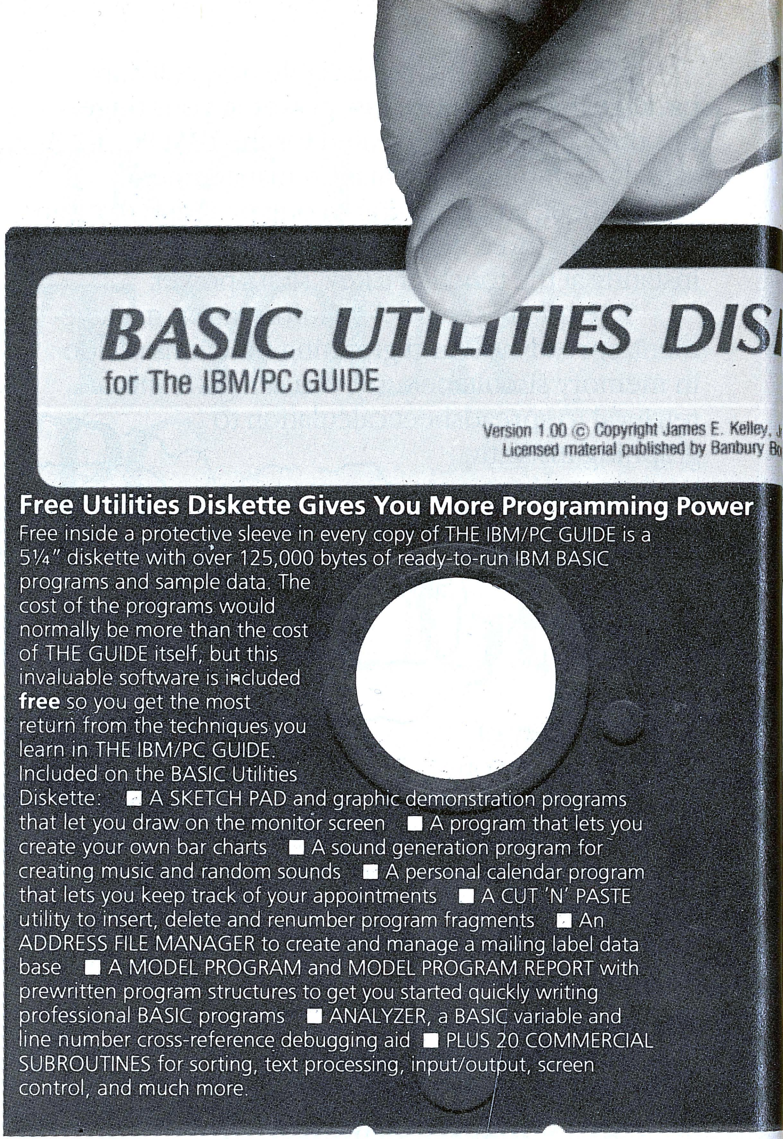
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BOARDS & BUSES

by Steve Schmitt

As prices drop, Winchester disks become continually more attractive for microcomputer systems. And why not? Hard disk systems offer increased processing speeds, larger file capacity, and greater operating convenience. Moreover, the higher performance gets more out of sixteen-bit microprocessors and expands the range of their potential applications.

This month we'll look at Winchester disk systems for the IBM pc. But before comparing the assortment of available products, we need to discuss some basics. Terminology describing hard disk systems can get quite technical. If manufacturer performance claims and product specifications confuse you, don't be discouraged; you're not alone. To help you gain a better perspective, we'll examine mass storage characteristics and define some simple, understandable performance measures.

The product review for this month features the Corvus Systems IB6 6-megabyte drive. In our next installment we'll evaluate three other Winchester disk products.

Winchester disks offer increased storage capacity—five to a hundred times greater than floppy drives—and significantly faster operating speed. But these nice offerings have their price. A hard disk system can be the most expensive part of your microcomputer. Typical costs are $1,000 plus $100 for every megabyte of storage. Selecting the right disk is an important decision.

Evaluating a Winchester's performance can be difficult. For some users, performance equates to the *amount* of disk storage. In single-user systems, this is probably a good measure. However, the *speed* at which you can access data becomes a factor in many applications. For example, the composite demand of multiuser systems requires a high disk-access rate.

Performance has different meanings. Disk specifications usually list technical characteristics, such as step rate, seek time, transfer rate, and average latency. What do these figures mean? The type of servomechanism and storage density are significant properties. All this information should tell us something, right? Unfortunately, this jargon is not only hard to understand; it may not even be indicative of how well the disk works with your microcomputer.

Several factors govern a disk's operation. First, the drive characteristics establish the upper bound of disk performance. They do not, however, tell you what real operation will be like. This is determined by two other components: the disk controller and the software drivers. The software drivers translate a program's request for file information into specific disk commands. The controller interprets these commands, signals the drive mechanics, and monitors disk operation. Design of the controller hardware, software driver algorithms, and file system structure contribute to the overall behavior of a disk system.

Two Simple Measures. Capacity and access speed represent the two most important features of a disk unit. Together, they make an easy-to-use performance metric.

Disk storage figures are commonly reported in two different ways: unformatted and formatted. From the user's standpoint, formatted capacity is most critical; it's the amount of space available for file data. Formatting entails dividing disk memory into blocks. Because the disk controller manages this process, formatted capacity reflects controller characteristics. One small note: capacity is usually expressed in megabytes, which technically means two to the twentieth power, or 1,047,552 bytes. Most manufacturers, however, use the term *megabyte* to signify one million bytes. The discrepancy between the ordinary use of the metric prefix and the meaning you may be accustomed to as a computer user becomes sig-

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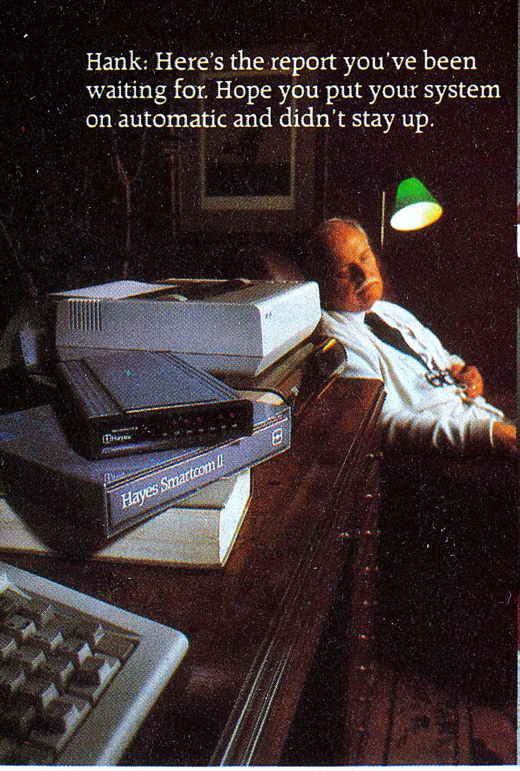
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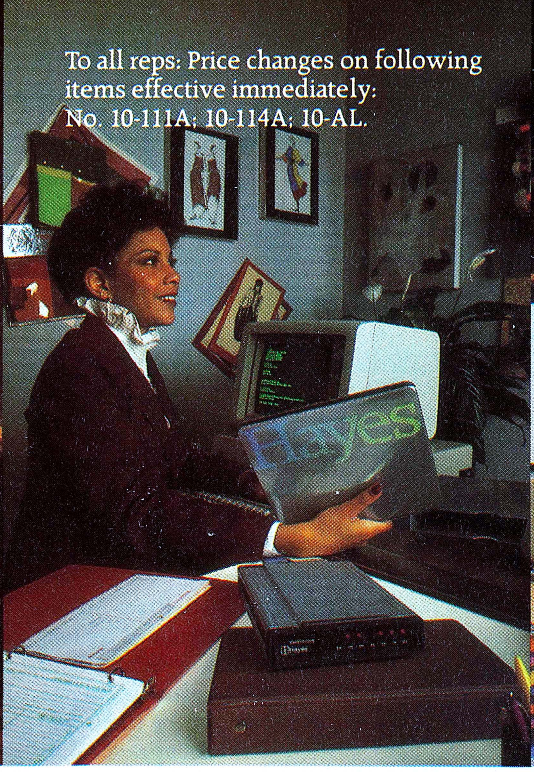
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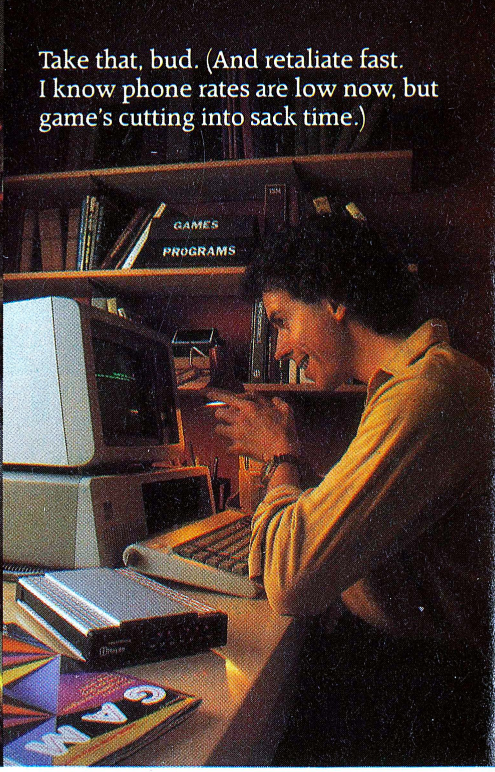
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It dials, answers and disconnects calls automatically, operating with rotary dials, Touch-Tone* and key-set systems. It works at full or half duplex, which simply means that connecting to a time-sharing system, while a big deal, is no big deal to do.

Indicator lights let you see what your Smartmodem is doing, while an audio speaker lets you hear it. (Is the remote system down, or was the line just busy? This way, you'll know.)

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Likewise, when you're on the receiving end. Only you really don't need to be. With Smartcom II and your Smartmodem 300, your computer does it all, completely unattended! That's especially helpful if you're sending work from home to the office, or vice versa.

But it's just part of the story. For instance, before you communicate with another system, you need to "set up" your computer to match the way the remote system transmits data. With Smartcom II, you do this only once, the first time. After that, the information (called parameters) is stored in a directory on the Smartcom II. Calling or answering a system listed in the directory requires just a few quick keystrokes.

You can store lengthy log-on sequences the same way. Press one key, and the Smartcom II automatically executes a whole string of numbers to connect you to a utility or information service.

And if you need it, there's always "help." Even while you're on-line, the screen will display explanations about a

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nificant when you get to numbers of this magnitude.

Throughput is a good indicator of a disk system's relative speed. Basically, throughput is defined as the total number of disk accesses that can be made in one second. To calculate this, we need to measure how long, on the average, it takes to make one disk access. The calculation proceeds as follows: add together the average *seek time* (the time required to move to a given track), disk *latency* (average wait before data passes under the head, or half the time of one disk revolution), and the time needed to read a sector (512 bytes divided by transfer rate, assuming 512 byte sectors, which is the most common sector size on hard disks). This yields a formula:

$$\mathbf{TP = 1/((\text{average seek time}) + (60/(2*\text{rpm})) + (512/\text{transfer rate}))}$$

For most disks, the last two terms in this formula equal approximately ten milliseconds; that's because most disks spin at 3,600 rpm. Since seek times are significantly larger than ten milliseconds (times between 30 and 210 milliseconds are typical) the formula can be approximated:

$$\mathbf{TP = 1/(\text{average seek time} + .010)\ \text{accesses per second}}$$

The product of the two measures, capacity and throughput, gives you a reasonable figure of merit. This performance measure allows you to compare drives. Dividing the cost of a disk system by this figure yields the price of a performance unit.

As mentioned before, drive specification alone can be a poor indicator of actual disk operation. You need a performance test that incorporates all pertinent components. The best way to accomplish this is to test the disk system with the intended host microcomputer.

Disk speed has two components: time required to reach the data and duration of transfer. The first component, access behavior, can be studied by observing the time required to transfer a number of small files. Copying a single large file gives a measure of the second component, the transfer rate.

The present review employed both tests.

Test set	Floppy to RAM	RAM to floppy	RAM to RAM
160K file	11.60	13.18	1.60
64 2K files	69.23	160.00	7.68

Table 1: Copy Operations.

			Performance gain over floppies	
Test set	**Corvus to RAM**	**RAM to Corvus**	**Reading**	**Writing**
160K file	7.40	11.21	58%	19%
64 2K files	24.87	53.97	196%	178%

Throughput/capacity Figure of merit:

Throughput: 7.4 accesses per second
Capacity: 5.74 million bytes (formatted)
Performance (maximum): capacity x throughput = 5.74 x 7.4 = 43.5
Cost per unit: $3,195/43.5 = $76.90

Corvus Product Specifications

Cost: $3,195
Version date: July 1982
IBM pc requirements: 64K, 1 160K drive
Storage specifications:
  6.5 million bytes (formatted)
  5.7 million bytes (unformatted)
Average seek time: 125 milliseconds
Peak transfer rate: 7.68 million bits per second
Rotational speed: 4,800 rpm
Documentation: user guide (26 pages) and installation guide (14 pages)
Package components:
  Winchester drive unit with power supply
  IBM pc interface board
  5-foot cable
  installation programs, software drivers, diagnostics, and mirror backup program
Physical specs:
  Height 5.3 inches
  Width 14.5 inches
  Depth 15.0 inches
  Two disk platters
  Disk diameter 5.25 inches

Manufacturer:
Corvus Systems
2029 O'Toole Avenue
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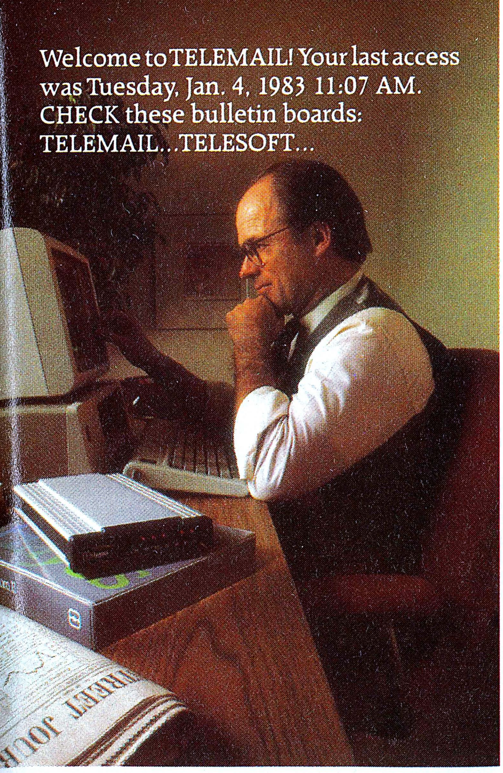
Table 2: Performance Statistics for the Corvus IB6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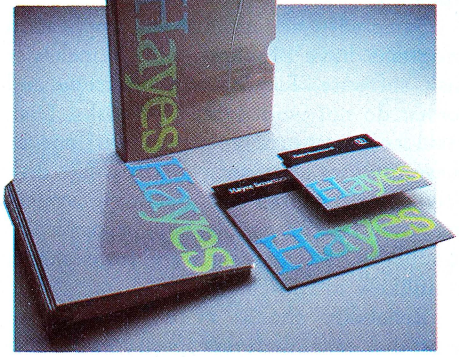

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Test 1 evaluated the disk system transfer rate, by measuring the time required to copy a single 160K file. Test 2 examined the access performance of the disk by copying sixty-four 2K files. Every transfer involved accessing the directory and then seeking the file's data.

Table 1 summarizes the results. Note that write times differ from read times. This is another variable influenced by the disk controller. RAM-to-RAM and floppy-disk-to-RAM transfers provide points of comparison for the test results. Note that the disk transfers use the standard pc-DOS *copy* utility. The RAM-to-RAM figure shows the amount of system overhead caused by the *copy* command.

Other Factors To Consider. An important element of any hard disk system is the backup method. Because hard disk systems hold such large amounts of data, backup can be a problem. There are three alternatives for saving the contents of a Winchester disk: copying to floppy disks, copying to magnetic tape, and using removable disk media.

Of the three, backing up a hard disk to floppies is least desirable. First, you need at least fifteen disks; high-capacity systems may need hundreds. Copying involves considerable user intervention, and the chances for error and data loss are significant.

Removable cartridges for Winchester disk systems have several benefits. First, you have unlimited storage capacity. Of course, this is also true of floppy systems. You create backups with the same procedures employed for floppy disks. Also, if the media becomes damaged, replacement is simple. Some problems do exist, however. Copying, without use of a fixed disk, requires more effort. You have to swap original and backup disks frequently. Furthermore, disks created on one drive may not work on another (future removable disks may eliminate this concern). Since removable Winchester disks are a fairly new technology, long-term reliability remains unproven.

Magnetic tape systems, especially integral cartridge units (systems in which the tape drive and hard disk are a single unit), provide the best backup strategy. Backup requires little user intervention, reliability is better, and transferring data to other systems presents fewer problems. Most cartridge tape systems have enough capacity to hold an entire disk with one or two tapes.

Compatibility is another important consideration when evaluating a disk system. Both the hardware and software of the disk unit should work with other IBM pc components. It is interesting to note that most disk systems cannot work with other hard-disk products. Each system modifies PC-DOS to include its disk software, preventing configuration of another by a similar process. In addition, the pc supports several operating systems. A disk system may only work for some of these. And, when a new version of the operating system comes out, the disk software will probably require updating.

Some software utilities and application programs have problems with Winchester disk software. For instance, *diskcopy* and *format* do not work with hard disks. Disk vendors must supply custom versions of these routines. Any software that uses disk drivers or modifies the operating system may not be compatible with a particular product. RAM disk software, for example, is unlikely to run correctly.

Reliability should be a key concern. Most disk manufacturers specify media lifetimes of about five years. Another measure to look at is the mean time between failure. This figure denotes the expected time before the product malfunctions. It's a good quality measure. Examine this figure for both disk drive and controller hardware, and use the smaller figure to estimate system reliability.

Most disks will develop bad areas that can no longer be used. Pay close attention to how well the controller handles these problems. A good system can remove some problem spots from active use. You should note how many bad data areas the disk system can tolerate.

To summarize, you should consider these factors when choosing a Winchester disk:

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Performance and capacity
Cost
Computer system requirements and applications
Compatibility (both with software and hardware)
Backup
Reliability

Winchester Products for the pc. Just like floppy drives, Winchester drives come in an assortment of sizes and enclosures. Disks for the IBM pc usually have diameters of 5.25 inches or less. Some packages are small enough to fit into a floppy drive slot. Other Winchester systems come as separate units that connect to your IBM pc. Each product includes an interface card that plugs into the system bus, a controller to operate the drive, and software that runs the hard disk system.

Installing a Winchester drive requires little expertise. First, you place the interface board in any open system slot. Next connect the drive and interface board and plug in the power cord. The hardware is then operational.

The final installation task is preparation of the disk software. The disk system comes with a program to configure the drive. Configuration procedures typically allow you to divide the disk storage into smaller units. Furthermore, you can usually specify the number of files to be allowed in a directory. You may be asked for a few other numbers, but all in all the task is straightforward. The entire procedure should take about fifteen minutes. Afterwards, booting the system with the configuration disk allows access to the hard disk storage.

Disk systems come with software applications. Some programs are diagnostics for testing the disk. Also, special utilities for high-speed copying or RAM disk may be included. If the disk system uses floppy backups, be sure there is a program to help coordinate the procedures.

The Corvus IB6 Six-Megabyte Disk System. The Corvus drive is a separate unit. Styling matches the IBM pc. The package includes the drive, a small interface board, cabling, documentation, and two 160K disks. Cost of the unit is $3,195.

The configuration procedure is very simple. A batch file guides you through the process in ten easy steps. A short installation guide clearly describes each task. Disk storage is divided into two units, each with about 2.75 megabytes of file space. You have the option of defining these as drives A and B or drives C and D. You may want more flexibility than this for defining your storage requirements.

Documentation consists of the installation guide and a user guide. The user guide discusses operation of diagnostics and backup software. It also details procedures for trouble-shooting the system. Both manuals are somewhat terse. Furthermore, the documentation lacks technical information describing system operation and components.

Corvus uses an interesting technique for backing up the disk. If you have a VCR you can store the data on video tape! Recorder format does not matter. Video cables connect to plugs mounted on the back of the disk unit. Corvus supplies a program to manage the backup procedure. The entire disk contents can be saved in about eight minutes.

Disk performance results, highlighted in table 2, identify some problems with the Corvus disk. Notice the relatively poor performance copying the 160K file. Writing to a Corvus disk is only 19 percent faster than copying to a floppy. This fact is even more surprising because the Corvus drive has one of the faster transfer rates among 5.25-inch Winchesters. The algorithm for transferring data must be inefficient. Operating gains when copying the small files are more in line with what you would expect; Corvus seek time is half that of the IBM (Tandon) floppy drives.

The performance figure based on capacity and access characteristics indicates additional problems. The cost per unit of performance does not compare favorably with other disk systems (as you will see next month). Multiuser systems require a high access rate. The Corvus access rate could probably support two, maybe three, active users (studies show that individual users average between three and five accesses per second).

The Corvus six-megabyte disk has been around for some time. It is very reliable. Corvus has a reputation for solid products, and the six-megabyte drive follows this tradition. Corvus disk drives come with a six-month parts and labor warranty. Besides the IBM pc, the disk system is compatible with most other popular microcomputers. Phase One Systems specifies Corvus drives for their multiuser business-oriented Oasis 16 operating system on the IBM pc. Corvus has a quality product; performance suffers most from the relative age of the hardware technology.

Corvus has other pc-compatible products. They make both ten-megabyte and twenty-megabyte Winchester drives. And these devices offer much higher performance. Another interesting product is the Omninet network. This system allows you to connect several pcs through the mass storage system.

Next time we'll review Winchester systems from Tall Grass Technologies, Tecmar (the Syquest 3.9-inch drive), and Genie Computer Corporation. A comparison of the results of evaluations should prove enlightening. ▲

TROUBLESHOOTING:
A GRAPHIC ACCOUNT

by John O'Shea

Technical Reference
IBM
AT TIMES LIFE IS PURE JOY!
Type Faces
Rolaids

Microcomputer users, unlike their counterparts in the world of big computers, have few resources when problems arise. Rarely is there a handy systems programmer, computer operator, applications specialist, or onsite hardware maintenance person.

Furthermore, many microcomputer users have limited experience in interacting with computers. They have enough problems even when everything works the way the manual says it should. When things go awry, the bewildered and frustrated user thinks, did I do something wrong? Is it the hardware? Is there a bug in the software?

Typically, users first turn to their salesperson for help. A quick visit to Computerland (or wherever the malfunctioning item was purchased) sometimes produces a satisfactory solution.

This approach may not work for complex problems. Although the purchase price includes a certain amount of support, vendors can't make a profit on unbillable time spent diagnosing problems. Too often, salespeople propose a "solution" with only a superficial understanding of the problem.

A Case in Point. From time to time I provide advice to a company that has a pc with 64K, two 160K disk drives, a monochrome monitor, an Epson MX-100 printer, a Hayes Smartmodem, and the necessary adapters and cables. For several months that system ran, without significant problems, *VisiCalc*, *PCModem*, and some Basic programs written in-house.

When the company converted its accounting functions to the Peachtree General

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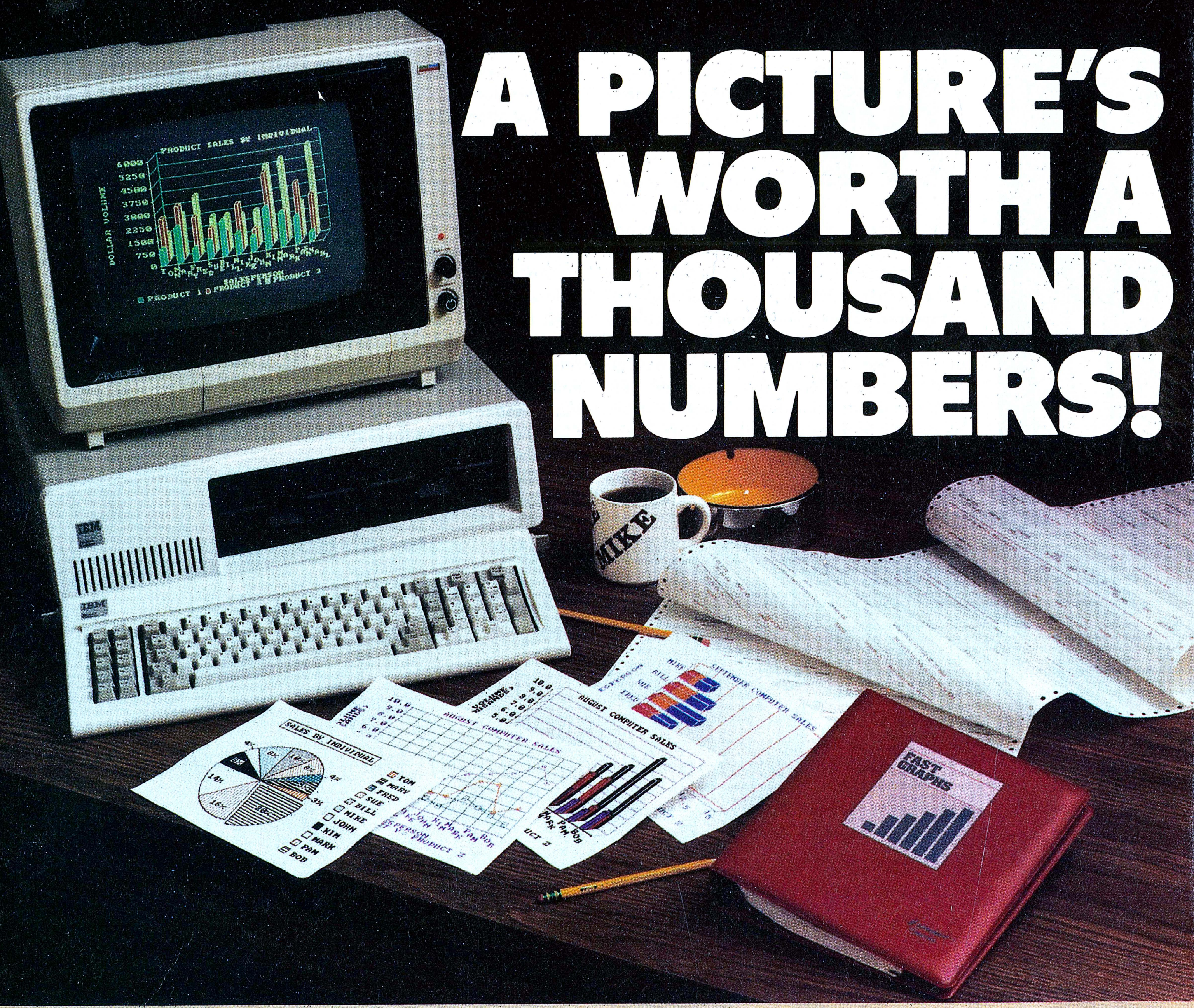
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Ledger package, everything worked fine for a while. Then the problems started. During transaction entry, a Basic error message (undefined line number) occasionally appeared. Although the transaction usually could be completed, it was recorded incorrectly. In subsequent attempts to access that record, the screen would fill with playing card symbols, smiley faces, and other assorted characters indicative of binary data in character mode. Next, the program would "break" with a Basic error message: illegal function call. The same problem occurred when the client tried to run the recover-data-files routine of the ledger package.

After verifying that they had followed the General Ledger's user manual exactly, they took the problem to the IBM Products Center where the machine had been purchased. To re-create the problem, the data was input into a pc there. Everything worked correctly.

The IBM analyst said that another customer using General Ledger had had a similar problem, which was diagnosed as hardware-related. The analyst thought my client's problem probably was due to a bad memory chip.

Since the machine was out of warranty and had no maintenance contract, it would have to be shipped to the IBM National Support Center in Greencastle, Indiana. Service would take about two weeks.

This was painful news for a company with just one computer. After considering other sources for service, the company decided to ship the machine to Greencastle and then get a service agreement. That way future service could be obtained at the IBM Products Center across the street from their office. But before biting the bullet they asked me to look at the problem.

A Second Opinion. The recover-data-files routine ran normally for me for about ten minutes, and then smiley faces and playing cards appeared on the screen. Next, the program gave a Basic error code of 5 and broke on line 63000 of the program. Looking at the Basic code, I noted that when the problem occurred the program was transferring control to an assembly language file-management routine (MIKSAM) whose function is to map account codes into physical disk addresses. Somehow this routine, which is used in several places in the General Ledger system, was trying to access memory addresses outside the available 64K.

I was not satisfied with a hardware-problem diagnosis. A hardware fault, such as a bad spot in memory, certainly could cause what might appear to be a software error, but why was my client having no problems using *VisiCalc* and other software? Why didn't the automatic hardware checks made when the machine is turned on indicate a problem? When the hardware diagnostics program was run, the machine checked out okay.

Still, the Peachtree General Ledger package is in wide use. Wouldn't a significant software bug have been identified by other users? We knew of only one other company experiencing difficulty. I wondered if perhaps no one else had discovered the bug because of some condition unique to my client's use of the system.

In seeking "unique" factors, I noted that the files used were of the maximum size allowable according to the user manual (one full disk) and that the memory size of the machine (64K) was the smallest allowed. Since the bug seemed to be an addressing problem, could it be that it happened only on small machines using large files?

Back to the IBM Products Center. The memory size of the machine on which the data ran without problem was 192K. When I asked about the size of the machine of the customer with a similar problem, I learned it was 64K. I told IBM my hypothesis that a software bug in the General Ledger system only turned up when big files were used on a small memory machine. According to my theory, my client's data should crash on all 64K machines and run well on larger machines.

The IBM analyst discussed the problem with the General Ledger specialist at Boca Raton and reported that Boca was sure we had a hardware problem. I suggested that we run the Advanced Diagnostics software on my client's machine. It ran with no sign of a problem, but IBM's analyst said that since this program does not test the power supply and the planar board, a hardware problem could not be ruled out.

I wanted further evidence of a hardware problem before I accepted Boca's diagnosis. I told the analyst I would test my hypothesis using my 128K machine, by changing the dip switch in the system unit to indicate only 64K on the system. He gave me a look that said I was wasting my time.

In Search of Smiley Faces. I ran the data on my machine confident that I would be seeing playing cards and smiley faces. To my chagrin, everything worked correctly. I called my client to say that maybe IBM was right. But I wanted to try one more thing before conceding.

The thought was that, somehow, moving the dip switch in the system unit was not enough. Whether or not the software formally recognized its existence, the fact was that my machine had more than 64K of memory. To test this theory I tried the data on another machine that physically had only 64K of memory. Smiley faces never looked so good.

Back to IBM. I expected the analyst would be pleased to learn the problem was not in hardware. But he still insisted that it

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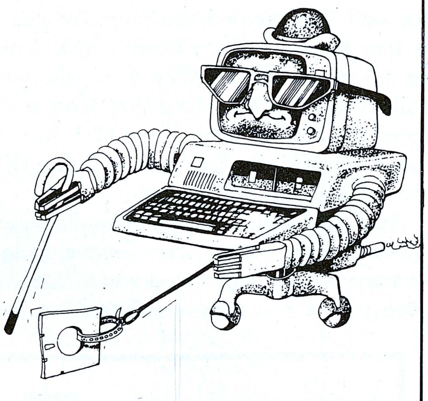

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was. I pointed out that, using the same data, the problem occurred on my client's 64K machine and another 64K machine—and did not occur on IBM's 192K or on my 128K machine. Since the analyst remained unconvinced, I made a copy of the data so he could try it himself on a 64K machine.

The next day, he confirmed that the problem did occur when he ran the data on the 64K machine. I expected a thank-you for solving their problem. I was stunned when he said that Boca still believed the problem was due to a hardware failure on my client's machine. Their reasoning was that the bad data, having been created on a malfunctioning machine, caused the program to try to access addresses outside of the 64K space. Therefore, when the data was run on 64K machines, the program would fail, while on larger machines it would run. The analyst then said that the problem might be due to the fact that one of my client's disk drives was a Tandon 100-1, which is not the same as an IBM drive. I installed that drive and it proved to be the same. I decided we had wasted enough time trying to convince IBM that its diagnosis was wrong.

As a final test, I loaned my 64K expansion card to my client. After General Ledger ran smoothly for three weeks with 128K of memory, the company purchased its own additional memory. The smiley faces have disappeared.

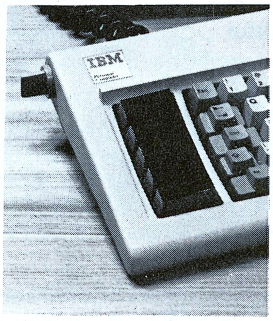
Whose Responsibility Is It? It is not my intention to criticize IBM, although clearly they blew this one. We were dealing with an inexperienced employee who could only pass on to us what Boca told him. I doubt very much that he had accurately conveyed to Boca the mounting evidence we had that the problem was in the software. I have dealt with IBM people for eighteen years and have found most of them extremely capable.

But if microcomputer users have no inhouse technical expertise to draw upon and cannot rely on what vendors say, even if that vendor is IBM, what are they to do about problems? Unfortunately, there is no obvious answer. While independent consultants can be very useful, they are expensive.

The burden for problem resolution falls finally upon the users themselves. To help, I've prepared a list of steps to follow in diagnosing a problem (see box, this page). Those who use it will at least be in a better position to judge whether a vendor's solution is reasonable. If a consultant is necessary, the data collected will help identify the problem sooner.

Problem solving isn't easy, but if users didn't like challenges they wouldn't have computers. ▲

1. Reread the user manual. Failure to follow instructions is the most likely cause of problems.
2. Run the hardware diagnostics. These tests may indicate clearly that the problem is hardware-related.
3. Isolate the conditions. Does other software run on your machine without problems? Do only certain aspects fail? Computers are consistent; when problems occur, there is usually a pattern to them. Identifying that pattern could lead to a solution.
4. Document your steps. This is essential and frequently overlooked. Make careful notes of error messages, conditions under which the problem occurs, and any actions you take to isolate and solve the problem.
5. Look for unique aspects. Most software packages are tested thoroughly before being offered for sale, but it's a rare program that is 100 percent error-free at its first release. Bugs that remain hidden in packages often are related to unusual data conditions. The accompanying article cites a case where a bug turned up when using the largest size file allowable by the program and the smallest memory size on the machine. Identifying what is unusual about your case may help isolate the problem.
6. Make some hypotheses about the problem. Write them down.
7. Test your hypotheses. Input other data to your system. Consult other users of the software. If another machine is available, try your data on it. If you can verify a hypothesis in two or three other cases, and if there is no case in which it fails, it may well be correct.
8. Talk with your supplier. Present your vendor, preferably someone who understands the package, with the information you've collected about your problem. If your vendor's diagnosis is inconsistent with what you've observed, push for a thorough evaluation of the error.
9. If necessary, hire an independent consultant. If your vendor's proposed solution is expensive or disruptive to your business, or if you doubt its validity, get a second opinion from an independent source. A few dollars spent on a consultant could save you considerably more if the supplier diagnosed your problem incorrectly.
10. Look for another package. If you are spending too much time eliminating bugs from your software, get rid of it, even if the vendor won't refund your money. There's plenty of good software on the market.



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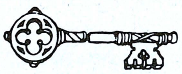
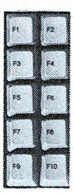
The  to the



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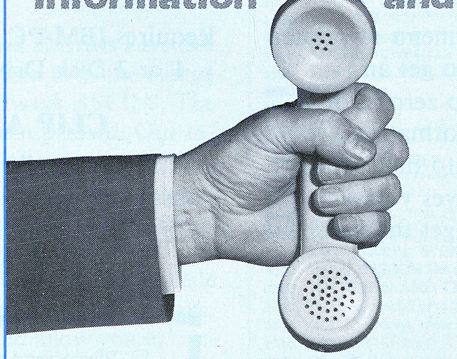

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THE BASIC SOLUTION

BY JOE JUHASZ

You've heard how easy it is to write programs in Basic, so you've finally decided to try your hand at it. After many long hours you've finally finished the Ultimate Mailing List. Or have you?

You get a friend to try it out. After a few seconds said friend presses the escape key. "BREAK IN 2100" appears on your screen.

Why would he press the escape key? *No one* would press the escape key in that situation. Would they?

"I can't handle every possible key!" you say.

With a little extra footwork you can.

The Basic *input* statement is an easy and powerful way to get data from the user. It's simple to code, and it allows use of the insert, delete, end, and cursor keys. That's where the good news stops and the bad news begins.

In response to an *input* statement, the user may press any key—often with undesirable results. Entering alpha characters into a numeric field, for example, can summon a nasty "Redo from start."

Other problems: you can't control how many characters the user will enter in response to an *input*. And there isn't any way to distinguish the press of a function key from the individual keystrokes that happened to be programmed into the function key.

Basic provides *inkey$* as an alternative way to accept data from the keyboard. The *inkey$* function returns the last key pressed. If no key has been pressed, *inkey$* returns the null string.

The following line waits for a keystroke and stores it in CK$:

200 CK$=INKEY$: IF CK$="" THEN GOTO 200

We could substitute *if len (CK$)=0* for *if CK$ = ""*, but then if we tried to extract *asc (CK$)*, we'd get an illegal function call if CK$ was a null string.

For certain special keys, like function keys and alternate keys (see Appendix G of the Basic manual for a complete list), the *inkey$* function returns two bytes. The first byte is always ASCII 0. The second byte indicates which special key has been pressed. Our input routine will go back for a second look if it reads an ASCII 0.

Inkey$ by itself is not extremely useful, but with a little care we can make it the basis of a selective input routine. This routine should allow you to limit the number of keys pressed; ward off illegal keystrokes; permit you to insert or delete characters; allow field editing by means of the insert, delete, end, tab, and cursor keys; handle function, control, and alternate keys; and allow you to control capitalization of input.

CKKEY (check key) will be the first step in this input routine. You the programmer, by means of certain variables, will define the allowable keys. Disallowed keys will be signaled by a tone. The calling program regains control only after an acceptable key has been pressed; the user need not press the enter key.

Variables set by the calling program:

CAPSON: If TRUE then lowercase letters are changed to capitals. If FALSE, input is unaltered.

MINKEY, MAXKEY: Defines allowable key range, in ASCII.

LEGAL.KEYS$(xx): Set of allowable keys not in MINKEY-MAXKEY range.

CALLER: Selects which entry of LEGAL.KEYS$ to use.

F.KEYS: Number of allowable special keys.

F.KEY.A(xx): Array that stores the allowable special keys. For function keys, set this variable equal to the function key number. For other special keys, set the variable equal to the second byte returned by *inkey$*; see Appendix G in the Basic manual.

CKFIELD.SW: If TRUE, we are processing a field; otherwise we're waiting for a single key (see next issue).

Variables returned by routine:

CK$: The key pressed.

FKEY: The number of the function key pressed (0 if none).

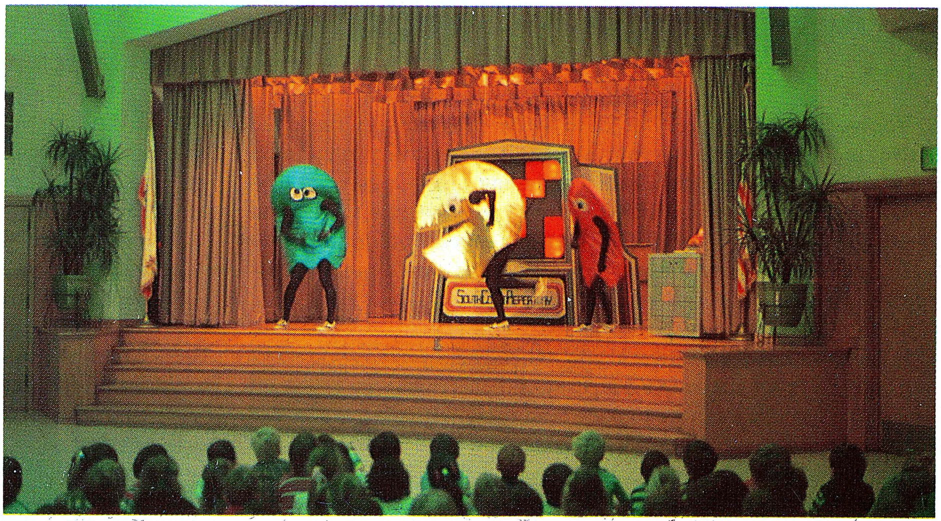
TCKI: ASCII value of other special key (second byte). ▲

```
1000       ' * ****************************************** *
1010       ' ***   SAMPLE CALLING SEQUENCE      ***
1020       ' ******************************************** *
1030  '
1040  GOSUB 4030                                          ' Initialization (do only once)
1050  '
1060  ' *** The following code will call CKKEY and accept only
1070  ' *** these keys: s,S,h,H,d,D,p,P,x,X; F1; 0,1,2,3,4,5,6,7,8,9
1080  ' *** The key will be printed, and we will wait for another key press.
1090  ' *** Function key #1 will stop the program.
1100  '
1110  KEY OFF : FOR I = 1 TO 10 : KEY I,"" : NEXT         ' Set function keys to nulls
1120  LKEYS$(1)="SHDPX"                                   ' Initialize set 1 of legal keys
1130  CAPSON=TRUE                                         ' Force all input to be capitalized
1140  MINKEY=ASC("0"): MAXKEY=ASC("9")                    ' Set up allowable key range
1150  CALLER=1                                            ' Use set #1 of legal keys (see 6070)
1160  FKEYS=1                                             ' Allow only one special key
1170  FKEY.A(1)=1                                         ' Fill allowable special key array
1180  GOSUB 5030                                          ' Wait for allowable key
1190  IF FKEY=1 THEN GOTO 1220
1200  PRINT CK$
1210  GOTO 1180
1220  PRINT "Function key #1 pressed — Stopping"
1230  END
4000       ' **************** *
4010       ' ***    INIT      ***
4020       ' **************** *
4030  '*** initialization ***
4040  ENTER$=CHR$(13): BKSPC$=CHR$(8): TRUE=-1: FALSE=0
4050  DIM F.KEY.A(15), LKEYS$(10)
4060  RETURN
4070  '
4080  '
5000       ' **************** *
5010       ' *** CK KEY    ***
5020       ' **************** *
5030  '*** ckkey ***
5040  IF INKEY$><"" GOTO 5040                             ' clear keystroke buffer
5050  FKEY=0: TCKI=0                                      ' reset variables
5060  CK$=INKEY$: IF CK$="" GOTO 5060                     ' wait, place keystroke in CK$
5070  '*** If CAPSON then convert to uppercase
5080  IF CAPSON AND CK$>="a"AND CK$<="z" THEN CK$=CHR$(ASC(CK$) AND &HDF)
5090  '*** For special keys (such as function keys) INKEY$ returns 00 + xx
5100  '*** To process these special keys, goto line 5160
5110  CK=ASC(CK$): IF CK=0 GOTO 5200                      ' check for special keys
5120  '*** Check key and see if it is within allowable range
5130  IF CK>=MINKEY AND CK<=MAXKEY GOTO 5310  ' good keys
5140  '*** The following statement will be explained in the next issue
5150  IF CKFIELD.SW AND (CK$=ENTER$ OR CK$=BKSPC$) GOTO 5310
5160  '*** Check key and see if it is part of the allowable set of keys
5170  IF INSTR(LKEYS$(CALLER),CK$)=0 GOTO 5300 ELSE GOTO 5310
5180                                                      ' 0 indicates error; all else ok
5190  '*** Process special keys (00 + xx)
5200  TCKI=ASC(RIGHT$(CK$,1))                             ' get second byte of special key
5210  '*** Special test to determine if a function key has been pressed
5220  IF TCKI>58 AND TCKI<69 THEN TCKI=TCKI-58: FKEY=TCKI
5230  '*** The following statement will be explained next month
5240  IF CKFIELD.SW AND INSTR(SPECIAL$,CK$)>0 GOTO 5310
5250  '*** Test array of allowable special keys
5260  FOR TI=1 TO FKEYS
5270  IF TCKI=FKEY.A(TI) GOTO 5310
5280  NEXT
5290  '*** If you land here, an illegal key has been pressed
5300  SOUND 50,4: GOTO 5040                               ' tone to signal a bad key
5310  RETURN
```

newspeak

Δ **My Fair Micro.** There's a wonderfully ironic twist at the end of the musical play *Bits and Bytes.* Morton B. Norton, supersalesman of Computer-rama, gives up. He finally realizes that his potential customer can't possibly afford to buy what he's selling. He tells the young girl, Happy, that public libraries, workshops, clubs, and magazines are ways to learn about and use computers without buying one.

This final-act resolution contrasts well with the opening song of the South Coast Repertory touring production. Playing mainly in southern California elementary schools, *Bits and Bytes* begins with a musical number praising the computer revolution and imploring the audience to ''get your computer right away.''



Bits and Bytes *takes a humorous but educational look at the computer age. In this scene three Pac-Man characters are dancing and singing about the joys of computer games.*

The entire cast of *Bits and Bytes* consists of five performers, with three actors playing multiple roles. The set, a funky, make-believe computer store, is dominated by an overgrown, multicolored checkerboard that is supposed to be a computer monitor. The disk drive is a box with a slot big enough for a twenty-four-inch floppy disk. Disks are made of flimsy foam-packing material and provide some of the play's more slapstick moments.

Running around forty minutes, *Bits and Bytes* is a very enjoyable kids' view of computers. Morton B. Norton (James LeGros) ''can outsell everybody,'' but he doesn't know much about computers. His two helpers are Bits (Deborah Nishimura) and Bytes (Sam Hamann). Early on, they inform the audience that real bits and bytes are what computers use to remember things.

Hungrily searching for a customer, Norton finds Happy (Laura Leyva), a decidedly *unhappy* little girl. Fast-talking and pushy, Norton closes in for the kill: ''Sales are our game. So let's talk hi-tech. For remembering things a computer is better than an elephant, and a lot cleaner, if you know what I mean.''

Bits, Bytes, and Norton break into a song for Happy's benefit that proclaims, ''Use a computer and you'll have it made. It'll do your homework and raise your grades. Buy a computer and solve your problems for real.''

Happy wants to make sure the machine will work before she buys it. (''A wise consumer, a quick chick,'' says Norton.) He shows her how it can help with homework. (''Oooh, homework. Grody to the max,'' says Happy.) Then, in one of the play's most madcap scenes, Norton shows her some educational programs—*Pirates of Pronouns, Star Words, Star Words II: The Adverbs Strike Back,* and finally *Spelling.* (''Oooh, gag me, my worst subject,'' winces Happy.)

The next number is cute. Norton explains how computers are making old office machines useless. Three of the actors, dressed as a calculator, a typewriter, and a file cabinet, sing a mournful song: ''We're obsolete, we can't compete. Last year's smash is this year's crash. We had our day and that's the way it is with technology.''

Happy decides that she would like a program that would help her find the right boy. Bits writes the program while, to the delight of the crowd, Happy picks out several young bachelors from the audience and lines them up. (''He must be taller than me and a surfer. He must have hair and not be into disco or slam dancing.'') But the program has a bug and doesn't pick any of them for Happy. A computer hacker's worst fears are realized when two four-armed bugs emerge from the computer and dance around gleefully singing a nasty bug song.

But writing custom programs is not exactly what Happy had in mind. (''It sounds too much like work. I want to have fun.'') The games number ensues, with three giant *Pac-Man* characters dancing, singing, and chasing each other. It's great fun and the kids love it.

Finally Norton pushes Happy to sign on the dotted line. (''All you have to do is sign here and we will automatically get your weekly allowance of two dollars and ten cents for the next fifty-seven years, twenty-seven months, and three days.'') But Happy wants to make sure that the computer will make her truly happy. She asks it that crucial question that causes the machine to blow up.

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Bits and Bytes, written by Michael Dixon and Jerry Patch, takes a refreshingly innocent approach to computers and manages to say something. Not all of the jokes are readily accessible to the children, and some of the lyrics get buried with all of the dancing and fooling around. Still the overall impact is exhilarating. The basics of computer technology have rarely been presented in such an entertaining and palatable fashion.

One teacher, referring to the attitude of the performers, commented, ''If teachers could be that uninhibited, the kids would learn a lot more.''

Bits and Bytes will be touring throughout the southern California area until June this year. South Coast Repertory is also distributing a brief study guide on computers for teachers who do not have access to computers in the classroom.

Δ **Crisis in Computer Education?** In the seventies, educators cried that Johnny couldn't read. Today, they're concerned that Johnny can't compute; but the problem isn't necessarily with Johnny.

Despite overall declining enrollments, colleges and universities can't accommodate thousands who want a computer education, and the story's little better at the grade school level. The problem? Not enough teachers and inadequate facilities.

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Thus far, says Hubbard, high-tech companies have agreed to sponsor eighty of the two hundred fellowships, but their efforts will be undercut in the long run if teacher salaries continue to average 30 percent less than those of industry. For that reason, the AEA is also looking into short-term add-on grants to boost faculty salaries, while lobbying Congress and state houses to enlarge their commitment to computer education.

Hubbard is pleased that remedial steps are being taken, but she's concerned the computer industry will permanently lose the services of many gifted students for whom there is inadequate teaching space today. The gap is too great to fill quickly, she says, and time may be working against us. Demographic trends indicate the manpower pool that industry must draw on is steadily shrinking.

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Δ **Perry White in the Information Age.** An
amazing thing has happened at the *Pasadena*
the daily

world using the complete pagination system for newspaper production.

Pagination is the process of designing a page on a terminal screen, using a customized graphics tablet and a mouselike device for input. Preedited and coded components (pictures, headlines, text), stored in a computer's memory, are called up onto a grid and keyed into blocks that represent the inches and columns on the actual page. The scaled-down elements on-screen are manipulated to the operator's satisfaction, allowing freedom to try different layouts and arrangements expeditiously. When a page is finished, a complete, camera-ready Velox is
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newspeak

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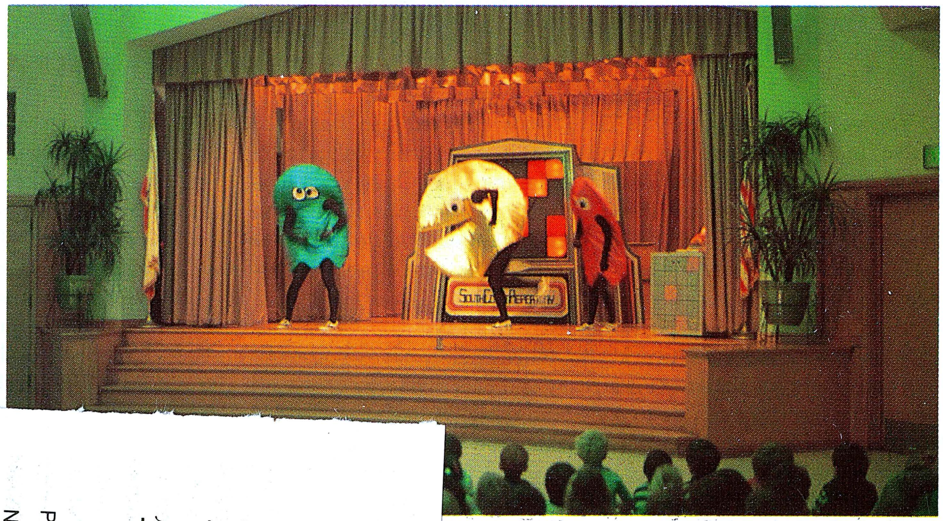

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Fewer qualified graduates augurs badly for the beleaguered United States computer industry. It now confronts the Japanese challenge knowing that last year there were only fifty thousand engineering and computer science graduates to fill one hundred fifteen thousand industry slots.

"We've looked at the whole problem and it's pervasive," says Patricia Hill Hubbard, president of the Education Foundation of the two-thousand-member AEA (American Electronics Association). "If we don't expand the basic university plant through increased teaching capacity, it's going to be a moot point how literate our high school graduates are."

Fortunately, the AEA, Hewlett-Packard, Apple, IBM, and other industry leaders are doing something about it. With a big assist from Hewlett-Packard, the AEA has launched a fellowship program designed to increase the number of engineering and computer science doctoral candidates by two hundred and encourage them to pursue teaching after graduation.

Hewlett-Packard has pledged $6 million from 1982 to 1987 for the three-part program involving twenty-two selected universities. It provides tuition support for four-year doctoral work, a living stipend, and a grant of new equipment if the graduate joins the science faculty of an accredited university, not necessarily one of the twenty-two.

Total benefits of the program to individuals range from $48,000 to $72,000, depending on whether the candidate attends a public or private school. All fellowship loans are forgiven if the candidate holds an accredited teaching position for three years after graduation—proportionally less if the teaching is for shorter durations.

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"If these students today can't get into higher education," she warns, "there won't be engineers to design the products and we'll have lost our competitive edge."

Δ Perry White in the Information Age. An amazing thing has happened at the *Pasadena Star-News*. Over a year's time, the daily southern California newspaper has reduced the number of employees in its composing room by over half, from twenty-two to nine. At the same time, they have nearly doubled their output. In addition to the *Star-News*, Knight-Ridder Newspapers publishes the daily *All-Sports* newspaper and several local weeklies.

Right now, the *Pasadena Star-News* is the most technically advanced newspaper in the world. It took lots of money, but the owners are like pioneers in a wild new frontier. They'll be called loco at first, and then other publications will recognize the rich, untouched territory opening up.

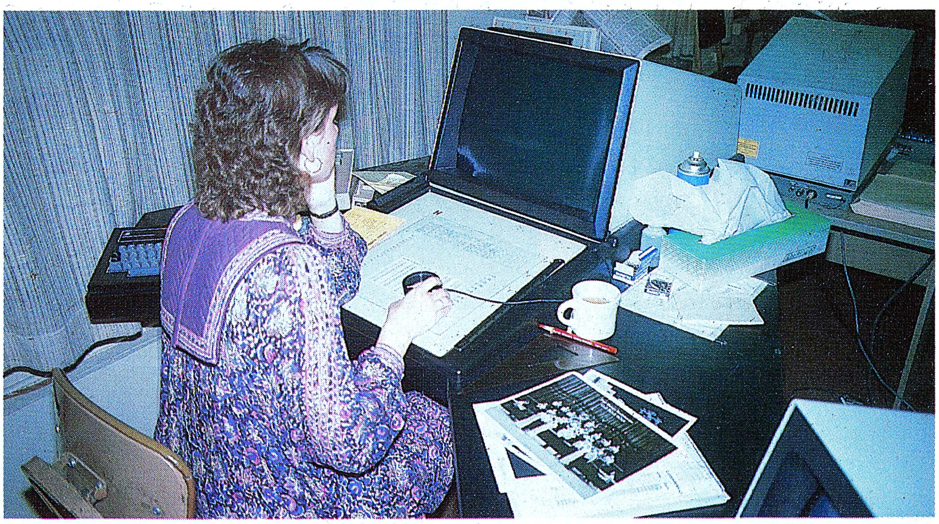
The eventual goal of the *Pasadena Star-News* is zero employees in the composing room. The paper has a complicated machine that can do the work faster, more accurately, and, in the long run, cheaper.

The Newspaper Pagination System (NPS), specially developed for the *Star-News* by Information International of Culver City, California, is an expanded and adapted version of their "electronic scissors" computer systems used by several national weekly newsmagazines, including *Time*, *Newsweek*, and *U.S. News and World Report*. The *Star-News* is currently the only newspaper in the world using the complete pagination system for newspaper production.

Pagination is the process of designing a page on a terminal screen, using a customized graphics tablet and a mouselike device for input. Preedited and coded components (pictures, headlines, text), stored in a computer's memory, are called up onto a grid and keyed into blocks that represent the inches and columns on the actual page. The scaled-down elements on-screen are manipulated to the operator's satisfaction, allowing freedom to try different layouts and arrangements expeditiously. When a page is finished, a complete, camera-ready Velox is printed out through a separate phototypesetting process.

Before the electronic make-up portion of the process takes place, elements of the newspaper page—ads, headlines, stories, bylines, screened photographs, and so on—have been entered into the main computer separately, using a "front-end" computer system, with terminals in each of the major departments. All the front-end terminals are linked to the main computer, where the information is stored for retrieval by the make-up editors who work at the pagination terminals.

The NPS is made up of four subsystems. The first is a scanner for digitizing artwork—photographs and line drawings. The second is a graphic merge and storage subsystem, comprised of two file managers and a pair of 200 megabyte disk drives, which receive and store text and formatted illustration files, interfacing with the SDC Text-II host computer system. The third subsystem is page make-up, where the pages are formatted. Typesetting output is produced by the fourth subsystem, which consists of two InfoSet 400 Pagesetters. These are devices that set fully made-up, illustrated, broadsheet pages that are then put in front of a



With the Newspaper Pagination System, manipulating the elements of a newspaper page is accomplished easily with a mouselike device.

camera and shot into negatives for press plates.

The computerized production of the morning paper occupies parts of three floors of the five-story Star-News building. On the first floor, classified ads, taken over the phone, are entered directly into the front-end system's data banks, called directories. A dictionary is built in, and the order of the classifieds can be determined by terminal operators who assemble the pages each day. Classified display ads are also created at make-up terminals on the same floor.

Front-end editorial work and pagination is done on the third floor. On the fourth floor wire-service information, via satellite, comes straight into the computer system. The chattering Teletypes of the traditional newsroom are now an on-line process.

On the fourth floor, in the air-conditioned and glass-walled computer center, is the scanner that does the scanning once done in the camera room of the composing department. The mechanical paste-up operations that the computer has yet to take over are also done on this floor.

Production director for the *Star-News,* Les Wiltse, oversees the whole computer operation from his office on the fifth floor, as well as fielding calls from other papers interested in how the system is shaking down and consulting with debuggers and production specialists working on the system's gradual expansion.

The most frequently asked question, Wiltse says, is how much did all this cost? The system has a $1.9-million price tag. "Certainly no small change for an operation with our revenue," says Wiltse. "But it's cost-effective. We expect to meet our original estimate of a four-year payback."

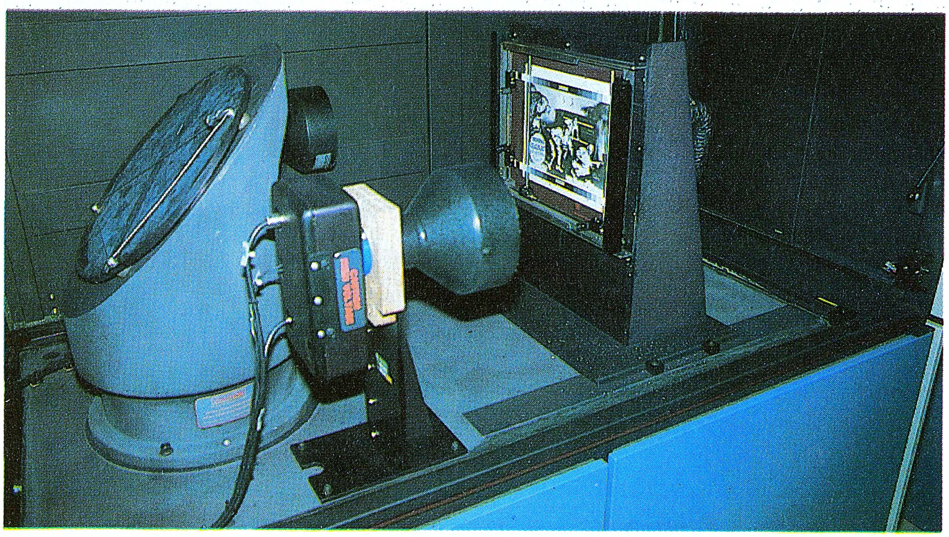
The pagination process is still expensive for large newspapers, like the *Los Angeles Times,* which has a front-end system in use but is holding off on pagination. Advancements in disk-storage technology will soon make the system more readily available. The *Los Angeles Times* makes in a week what the *Pasadena Star-News* makes in a year ($15 million). The *Times* also prints about fifteen hundred pages a week to the *Star-News's* three hundred to three hundred fifty pages.

Still, the benefits of the pagination system in a medium-sized newspaper environment are many, according to Wiltse. "Revisions and corrections can be made very quickly, layout editors never have to rebuild anything from scratch. The display of line art on the screen is a tremendous advantage, especially when the art is irregularly shaped," Wiltse explains. "The layout is automatic. New material is entered and simply 'flowed' into position.

"Make-up editors can take the time they need to get the quality they want. They're not looking over the shoulder of a paste-up person at a drawing board in a bustling composing room anymore."

One of pagination's biggest advantages is in the area of aesthetics. "Cold type has never been able to achieve the precise make-up of hot metal. Now we have the best of both worlds, the flexibility of cold type and a precision inherent in a modern digital computer to keep gutters and margins even, headlines straight and all graphic-arts elements under electronic control that cannot be equaled by any mere mortal. Nothing's going to be crooked, and the spacing won't be bad, and nobody's going to drop a line."

"Hot metal" is a reference to the Linotype machine, introduced into the publishing industry in the 1880s. It was a huge contraption of belts and moving arms that rivaled the best work of Rube Goldberg. A skilled operator would retype a story and the machine would cast it into metal lines of type at a speed of about sixty words per minute. Linotype machines were used at the *Star-News* until 1973.



The scanner digitizing artwork for input into the pagination system.

Photocomposition revolutionized the composing room in the sixties. The rate at which type could be generated in justified form by the new photographic method was seventy-six hundred words a minute. Galleys of type are developed chemically and pasted into boards. Metal press plates are made from the negatives of these page boards. This cold-type process is what the majority of magazines, newspapers, and books use today.

Now the photocomposition process is clearly threatened by the computerized composing room. "The composing room is no longer the beehive of activity that it was just a few years ago," says Wiltse. "Once, one hundred people worked in composing at the *Star-News.* With a tough stance on union negotiations, some generous offers, attrition, and other factors, the composing room now only has nine people."

The only stumbling block to total computerization at the *Star-News* is a union restriction involving the make-up of display ads, a point that is still in negotiation.

Unions across the country are understandably opposing automation of the newspaper business—across the board, from front-end editorial to the composing room. There was an uproar from the same sectors over the introduction of the Linotype and the photocomposition processes as well. Nobody likes losing jobs, and no one knows how difficult and expensive retraining will be.

Training new editorial and classified people to work on the pagination system is an in-house activity at the *Star-News* and is simpler than imagined. Trainees are surprised at how easy the system is to learn and operate. "New employees are given a course on the front-end system as soon as they are hired. Three days of on-the-job training followed by a couple of weeks of hands-on experience at a page make-up station is usually enough," says Wiltse.

All the union tumult, retraining, and expense aside, "pagination is here to stay," says Wiltse. And that means it's time to start hawking all those grease pencils, T-squares, and X-acto knives.

Δ **Profitable Steeling in Texas.** The country's largest steelmaker and "Big Eight" chief negotiator, United States Steel Corporation, is currently bargaining with labor leaders in hopes of curing the "ailing steel industry." Competition from Japan and Western Europe, the recession, and the loss of the international market have seriously injured big steel companies in this country.

The result is the closing down of large steel mills all over the United States, particularly along the "rust belt" from New Jersey to the Great Lakes. Bethlehem Steel recently closed its Los Angeles plant perma-

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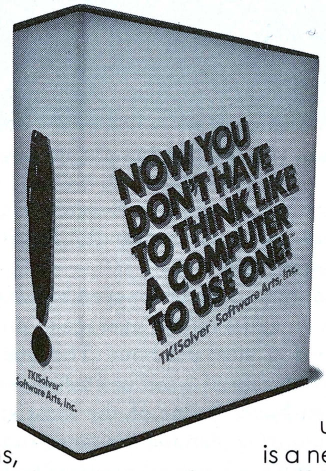
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nently, laying off more than one thousand workers, and the company is facing the greatest single-year loss in its history. Only twenty-five years ago, Bethlehem's L.A. plant had been considered the most modern and efficient steel mill ever built. Nowadays, its West German and Japanese competitors are using the latest technology and management techniques to outproduce and outprofit once indomitable Bethlehem.

No one can say for sure what could save the ailing steel industry, but examples exist that suggest a different approach to the job of making steel. Not unlike independent filmmakers who flourish away from Hollywood and its aging studios, smaller steel companies are trimming their operations and adapting some of the techniques that have made foreign steel producers so successful in recent years.

For instance, in 1982 Chaparral Steel Company in Midlothian, Texas, reported earnings of $11 million on sales of $160 million. A small operation in comparison to the Big Eight, to be sure, but the key word here is *profits*. In the midst of the worst steel industry slump since the Great Depression, this thriving Texas "minimill" has its head well above water.

Large steel mills like Bethlehem Steel's permanently closed Los Angeles plant have fallen on disastrous times.

Chaparral, with only seven hundred fifty employees, puts out an average of one hundred tons of steel per hour. The company's production rate of a ton of steel in less than two man-hours is one of the most efficient in the industry. Among the more automated of steel mills, Chaparral has used computers since it opened in 1976. The mill began with "an old Xerox computer," says Michael Redmon in the data processing department, referring to a Xerox 530 that worked in the melt shop.

The Xerox was unable to keep up with the progress of the company, and they soon outgrew its capacity. The Xerox, which Chaparral donated to a local high school, was replaced about two years ago with a Hewlett-Packard minicomputer.

The system's primary function is monitoring the casting process in the melt shop—maintaining the proper temperature and logging the number of hours the process is used. The computer controls the furnace subject to override from the operator. In addition to monitoring, the Hewlett-Packard provides chemical analyses for all of the metallurgical testing done at Chaparral's lab. The desired chemistry is entered into the system, and it lists the required alloys.

The forty-acre site also includes a medium-section mill where a complete Japanese computer system by Fuji, with a powerful assembly-language-type program, is being used. Five microprocessors control different sections of the mill, constantly monitoring each other at the same time. Position and speed control, sequence timing, and safety interlocking are all maintained by the Fuji system.

Most of the programming had already been done by the Japanese. However, they trained some of Chaparral's employees, including a group of electricians who were sent to Japan to learn trouble-shooting techniques.

Chaparral has received more than computers from Japan. It has also adopted some of the Japanese management techniques and business practices, like uniting the worker and the front office, retraining, and sharing profits. Ironically, while many of their counterparts from the major steel mills are running out of employment benefits, Chaparral workers are collecting overtime.

The seven-year-old "minimill" is proud of its on-site instructional offerings. Two permanent employee instructors teach electrical and mechanical courses on various aspects of both disciplines. Voluntary classes are held an average of eight hours per week for six to eight week periods. All hourly employees attending classes receive, in addition to their regular workweek, overtime pay.

The classes are limited to those working in the specified fields. However, the company does not limit educational opportunities to what is offered on-site.

Michael Cseay, an electrical technician in the medium-section mill, has been with Chaparral a year and a half and has been sent to four different training programs in various parts of the country. He is leaving soon for yet another program in Houston.

"One thing I like about this mill," Cseay commented, "is they want everyone to learn." Cseay, a former Tandy employee, emphasized the company's desire to "keep up in a high-tech world." He also added that employees in all areas at Chaparral get the opportunity to attend classes in their fields.

Nonunionized (all employees are on salary), Chaparral does not believe in layoffs, company cars or planes, time clocks, executive secretaries, or executive parking places. In seven short years it has become one of the top twenty steel producers in the United States. Workers seem happy, and they're making a little money.

Bethlehem Steel would love to make "a little money."

Δ **Managing by Modem.** In the "information age," keeping one's job often requires keeping up with change. Blue-collar and white-collar workers alike may have to adapt to new technologies in our fast-changing, fast-paced society. Even high-level management will not be spared retooling and reorganizing as computer technology provides the necessary implements of change.

According to Western Behavioral Sciences Institute president Richard Farson, the assumptions and styles of traditional management are no longer sufficient in modern businesses. Managers and executives must adapt to the changing times.

The WBSI is helping executives learn to adapt through its School of Management and Strategic Studies, based in La Jolla, California. The school was established to provide an intensive two-year educational program for a limited number of key executives from business, government, and nonprofit organizations.

The School of Management has enlisted the services of some of the nation's leading scholars and scientists. The objective of the two-year ongoing program is to get executives to learn from the faculty and from each other about the changing requirements of leadership in the coming decades.

Participants come from the leadership ranks of the private and public sectors. They include presidents of corporations, leaders from government agencies, heads of academic institutions, and entrepreneurs heading developing businesses. Not just anybody can take part in the program. Participants are nominated by their sponsoring organizations and are evaluated by WBSI to make sure all class members are compatible.

The six-month course now being taught, entitled "The Management of Scarcity and Abundance," follows the school's first two, "The Private Sector and the State" and "Technological Progress and People," which were taught last year. Beginning this July, the course, "Globalism and Interdependence," will be offered. Because each course will be repeated at two-year intervals, participants may enter the program any time a new segment is beginning.

Once the students are chosen, they meet the faculty in La Jolla for a seminar, where they are taught the basics of computer teleconferencing and are given hands-on experience with microcomputers. At the end of the session, each participant takes home a computer and printer, which serves as a link to fellow students and WBSI faculty.

By virtue of its crucial link in the School of Management's style of instruction, teleconferencing is one sophisticated application that participants are introduced to right at the start of the program.

During the six months between meetings, participants and faculty "meet" and converse with each other via modem. Faculty members call up the central computer, and, after inputting their password, present questions and information drawn from their fields of expertise. At their leisure, participants read this material and can store it for printing hard copy later. They can also challenge the ideas given, offer suggestions and comments, and leave related information based on experience for the rest of the group to read.

Computer teleconferencing allows more than one person on the system at a time. When students call up, they can check to see who else is logged on and exchange live messages. Although participants can communicate via electronic mail on the system, allowing several users on-line at once lets their debate or exchange of ideas happen instantaneously.

Through its computer-transferred courses, the School of Management and Strategic Studies urges students to develop strategic thinking. Courses are divided into three- or four-week modules, each taught by an expert in the subject. Four themes—"fundamental values," "context of decisions," "human systems," and "understanding the past as prologue"—are included in all the courses, acting as the center for discussion. The faculty member responsible for each

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topic stimulates discussion with questions, case history problems, simulations, and exercises.

Apple Computer, Anadex, and Hayes Microcomputer donated computers, printers, and modems respectively for students who began at the program's inception in January 1982. New students now pay for their equipment, which includes a Non-Linear Systems KayPro II computer and a Gemini dot-matrix printer. The entire $12,000 tab, which includes tuition and equipment fees, is picked up by the participants' employers.

Δ **Eat Your Heart Out, Woz.** Get ready for the ME Festival. California State College, San Bernardino, is hosting a computer workshop and technology exhibit, April 22-24. The workshops feature hands-on encounters with microcomputers, including a special series on the handicapped. At least fifty industry exhibitors will display their latest wares. The ten-dollar workshop registration fee includes admission to the exhibit area. ME stands for "microtechnology for everybody."

Δ **Meanwhile, Back at the Ranch.** Unuson is planning to hold the second and third Us Festivals May 28-30 and June 4-5. Both festivals will be at the Glen Helen Regional Park in San Bernardino, site of last year's well attended, media-intensive extravaganza. The Memorial Day weekend fest will feature rock music, while the following week's bash will be country-music-oriented. As of this writing no firm announcements had been made about musical acts. Stay tuned.

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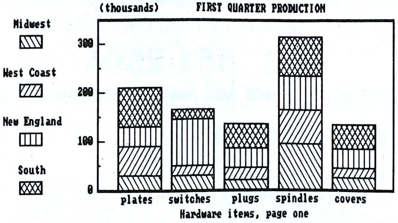

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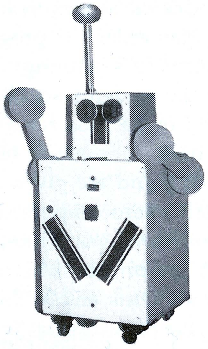
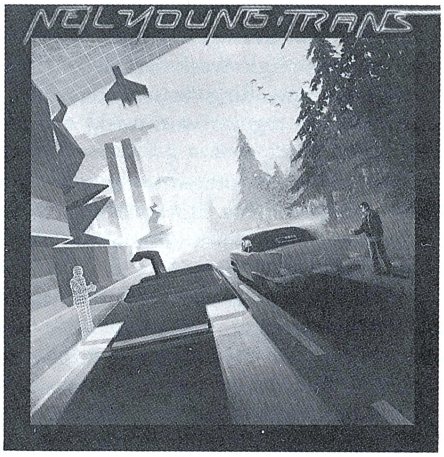
Δ **Do DROIG-BUGS Dream of Electric People?** Two of the cheaper (in cost and performance) hobby robots come from Robot Shack—a division of El Toro, California-based Dynamic Development. PR-1 has two arms that rotate ninety degrees, two faces (one female and one male), limited hearing, a digital clock, an optional water gun for squirting unfriendly people, a computer control panel, and a belly-button balloon inflator. Controlled by radio waves or computer programs, PR-1 costs $499. The DOID-BUG from Robot Shack is really a self-propelled, dome-shaped toy that moves forward until it hits an obstacle, then changes direction and repeats the process indefinitely. DROID-BUG costs $100. Both robots are more expensive toys than anything else, and they should appeal to children but not to many hard-core robotics hobbyists.



Δ **And on the Computer Music Scene.** Oh, for the days of "Heartbreak Hotel" and "The Twist," when rock 'n' roll was uncomplicated and didn't strive for relevance. Styx has brought beer-and-broads technorock to the eighties with a decidedly banal offering in the band's new album *Kilroy Was Here*. Voice-synthesized drivel about "Mr. Roboto" and rock 'n' roll's ability to save mankind from technototalitarianism make this album a real earsore. Much more interesting is Neil Young's cowboy lament to the computer age—*Trans*—released on Geffen Records, a Warner Bros. label. Most of the songs feature synthesized sounds, including vocoderized singing. With several keyboards, a drum machine, and assorted digital and analog equipment, Young has fashioned a sometimes bleak but always interesting look at a dystopian future. Songs like "Computer Age," "We R in Control," and "Computer Cowboy" are eerie electronic echoes of Orwell's *1984*—decrying the loss of love, individuality, and livelihood. "Transformer Man" is an especially effective tune about future hero worship of a sort. This is one of the strongest commitments yet to the new digital technology by a serious rock artist. Young's fans have had to survive as many directions in his music as albums he's released. Not ready to abandon his roots, Young will begin each show in his upcoming *Trans* tour with a solo acoustic set and then break out the high-tech jingles—the same concert format he used in the immensely popular *Rust Never Sleeps* tour a few years back. You'll probably hear Styx's bombastic blather on the radio much more than Young's grand experiment, but don't be put off. Computers are drastically changing the composition and presentation of modern music, and Young proves the new direction is accessible to more than just adolescent space cadets.



Δ **Screens, Scenes, and Machines.** Screenplay Systems of Burbank, California, has recently made available *Scriptor*, a sophisticated text-formatting program for the professional screenwriter. The program includes intelligent page breaking, remargination, pagination, scene numbering, selective page and scene printing, thirty formatting variables, and menu-driven commands. The CP/M-compatible *Scriptor* will soon be followed by *ScriptWriter*, a text editor specifically designed for the motion picture screenwriter.

Δ **And Now for the Computer Movie News.** Columbia Pictures has acquired the rights to Tracy Kidder's Pulitzer Prize-winning book *Soul of a New Machine*. The studio has not announced any plans for the material yet. Riding high on the success of *Tootsie* and *Gandhi*, Columbia is on a roll. In these days of steamy Richard Gere and tantalizing Sandahl Bergman, it's difficult to imagine how Kidder's retelling of Data General's Eagle minicomputer project could make much impact on the big screen. But Columbia just may be the studio to pull it off. ▲

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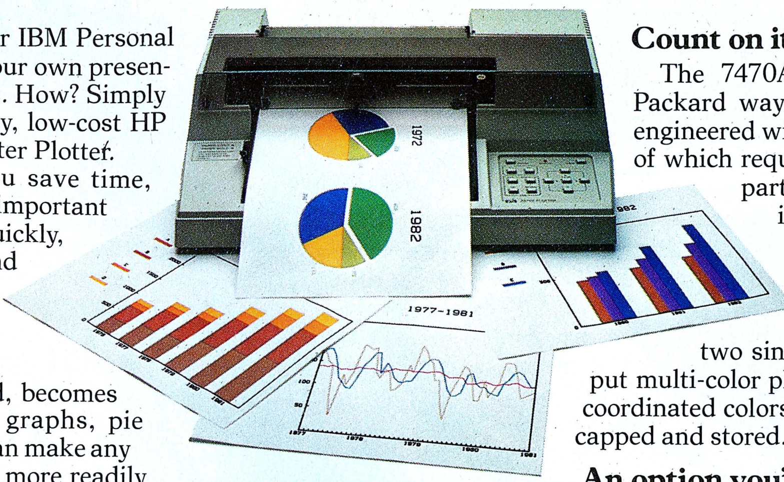

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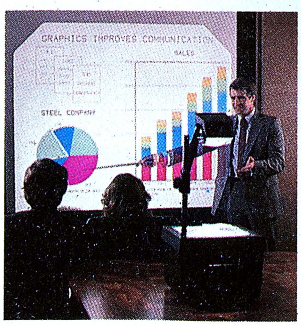

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QUESTIONS & ANSWERS

by Nancy Andrews

Q: I'm interested in using my IBM pc as a dial up remote graphics Tektronix PLOT10 compatible terminal. I know there is applicable Apple software available. Do you know of any for the pc?

Willy Albanez

A: We finally uncovered a terminal emulator for you. It's in the final stages of testing (aren't they all?) and should be on the market soon. It's called EMU-TEK, it's made by STG Data Systems, and it will emulate Tektronix 4006, 40010, 40012 models. What it does is receive the drawing commands and display them on your screen. Additional features will enable you to make a hard copy of the screen on your dot-matrix printer or to store the data on disk for printout later. Of course, your resolution is not comparable to the Tektronix; however, a new 720x348 resolution board is available from Hercules Computer Technology, and EMU-TEK will support this board as well as the standard IBM board.

Q: I have two questions. First, I'm considering buying a seven-megabyte database that is available in tape form. Its characteristics include seven-track with 800 bpi; nine-track with 800, 1600, or 6250 bpi; and unblocked or blocked, per user request. Is it possible to convert or load this database into my IBM pc with DOS 1.1 and Basic? If so, what characteristics should I request?

Second, I would like to purchase a commercial program that requires two disk drives. I currently have only one drive. For the sake of expense and speed, can I buy a RAM disk to use as a second drive and still use the purchased program?

Bob Savryk

A: First the bad news: buying a seven-megabyte database to use on your pc without a hard disk is possible but not practical. Here's what you would need to do. Since the pc has nothing to support that kind of tape interface, you'll need to have the tape read into a mainframe with a tape reader. Then you could connect to the mainframe via an RS-232 port and load this data onto diskettes. However, this large a database would fill twenty-one to twenty-five double-sided diskettes, or forty-two to fifty single-sided ones. With that many floppies, imagine what it would be like to search for one record. Characteristics of the tape would have to match those of the tape reader of the mainframe you were using, and your block size would be based on a multiple of the record size.

The good news is that you can use a commercial program for two drives with one standard drive and one RAM drive. All you need to do is load the second disk into the RAM that thinks it's the B drive, then put the first disk in your standard drive, and you should be ready to go (some copy-protected programs may try to thwart your first step—the transfer from physical disk to RAM disk, so make sure this is not a problem before you buy).

Q: I have a question about the *mode* command, which was discussed in System Notebook for December. I tried the command

```
MODE LPT1: = COM1:
```

and received only the message *Bad command or file name.* I also tried substituting Lpt2: for Com1:, with the same results. I have a Quadboard installed, with both parallel and serial cards, but nothing attached to the serial card. I would like to be able to switch printers in DOS, so that *EasyWriter*, *VisiCalc*, and other software would automatically output to Lpt2: instead of Lpt1:. Is this possible? Why did I get the error message?

I would greatly appreciate any enlightenment you could provide.

Delicia Dozier

A: There are two problems here. Apparently you got the message because the *mode* command was not actually present on the disk in your default drive. *Mode* is not a resident command that is loaded when you boot DOS and remains after you load another program. Try using it when the DOS prompt A> is displayed and your DOS disk is in drive A, or copy the file Mode.com onto your *VisiCalc* or *EasyWriter* disk and then call *mode* from those programs.

The second problem is that the *mode* command, for some reason, doesn't allow you to redirect printer output to a second parallel port (Lpt2:). Individual application programs may provide the means to make this switch, but *mode* does not! DOS 2.0 has corrected this strange deficiency. But just in case you don't yet have the new operating system, here is a remedy, courtesy of *Softalk* Switchmaster John B. Socha.

First, copy the file Debug.com onto your *VisiCalc* or *EasyWriter* disk. To do this, put your DOS disk in drive B and *VisiCalc* in drive A (if there's a write-protect tab on your *VisiCalc* disk, remove it; you can put it back on when you're all through with this procedure). Type *copy b:debug.com a:* and hit enter.

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Now type *debug printsw.com* and hit enter. You'll get an error message (*file not found*); ignore it. You'll also get a hyphen; that's Debug's prompt, and you'll get it at the beginning of most of the lines you're about to enter.

Type the following exactly, hitting the enter key at the end of each line:

```
E DS:100 B8 40 00 8E D8 A1 08 00
E DS:108 8B 1E 0A 00 89 1E 08 00
E DS:110 A3 0A 00 B4 01 BA 00 00
E DS:118 CD 17 CD 20
R CX
```

After this last line, you should see the following:

```
CX 0000
:
```

Next to the colon, type 1C and hit enter. Now type W, hit enter, and Debug will tell you that it's writing 001C bytes to disk. When the disk activity is done, check your work, by typing:

```
U 100 11B
```

This is what you should see:

```
04B5:0100 B84000      MOV    AX,0040
04B5:0103 8ED8        MOV    DS,AX
04B5:0105 A10800      MOV    AX,[0008]
04B5:0108 8B1E0A00    MOV    BX,[000A]
04B5:010C 891E0800    MOV    [0008],BX
04B5:0110 A30A00      MOV    [000A],AX
04B5:0113 B401        MOV    AH,01
04B5:0115 BA0000      MOV    DX,0000
04B5:0118 CD17        INT    17
04B5:011A CD20        INT    20
```

The first four characters of each line may be different for you, but everything else should match this list. If this is not what you see, you've probably made a typo somewhere; the best way to fix it is to start over.

Assuming all's well to this point, type Q to quit Debug. Now you have a program called Printsw.com, which will redirect printer output to your second parallel port. You can run this program simply by typing *printsw* when you have the DOS prompt (A>); but you'll probably find it handier to incorporate it into the autoexec batch files on your *VisiCalc* and *EasyWriter* disks. Here's how to do that.

First make sure the file Printsw.com exists on both your *VisiCalc* and *EasyWriter* disks. If you've followed us to the letter so far, the file will be stationed on the *VisiCalc* disk; copy it to *EasyWriter* with the DOS *copy* command.

Now with *VisiCalc* or *EasyWriter* in drive A, type:

```
TYPE AUTOEXEC.BAT
```

Note exactly what you see on-screen in response to this command. You're about to create a new autoexec file that will be just like the old one, except that it will start with a *printsw* command. Now type

```
COPY CON: AUTOEXEC.BAT
PRINTSW
```

Hit enter, then type each command that was in the original autoexec file, line for line, hitting the enter key at the end of each line. Finally hit the function-6 key (which should put the symbol ∧Z on your screen) and hit enter once more. At this point you should be in business. For extra safety, copy the original Autoexec.bat file to another file name (*copy autoexec.bat anyname.bat*) before you begin creating your new batch file.

Q: I have run into a problem when attempting to write games that incorporate the keyboard as input device. The keyboard can easily be overflowed as an anxious player holds keys down long enough to invoke the repeat function, resulting in annoying program pauses and squeals from the speaker. I was led to believe that a simple

```
10 DEF SEG
20 ...
1000 POKE 106,0
```

in the keyboard loop would clear the keyboard buffer. This is not exactly true. It clears the Basic interpreter's buffer but not the BIOS's buffer. I've found that by using the following Basic line, the problem can be rectified simply.

```
10 DEF SEG = &H40
20 ...
1000 POKE &H1A,PEEK(&H1C)
```

This makes the head and tail locations of the keyboard buffer equal. Correct me if my reasoning is incorrect.

There is one more item that is a question. If a Basic program is loaded by means of the DOS command

```
BASICA TEST.BAS
```

the cursor will be visible when it shouldn't be. If Test.bas is

```
10 GOTO 10
```

and from DOS you type the above command, the cursor will be visible. Now use control-break to exit the program, type *run*, and note that the cursor is invisible, as it should be. I would appreciate help, since I have some programs that are plagued by a cursor that roams the screen as certain items are updated.

Alan Boxall

A: What you've described is the difference between the way the cursor is handled in DOS and Basic. The simplest remedy is to put the statement *cls : locate ,,0* at the head of your Basic program; that will make the cursor disappear, no matter how you load your program.

DOS 2.0 will enable you to control the cursor yourself, and that should eliminate this anomaly. ▲

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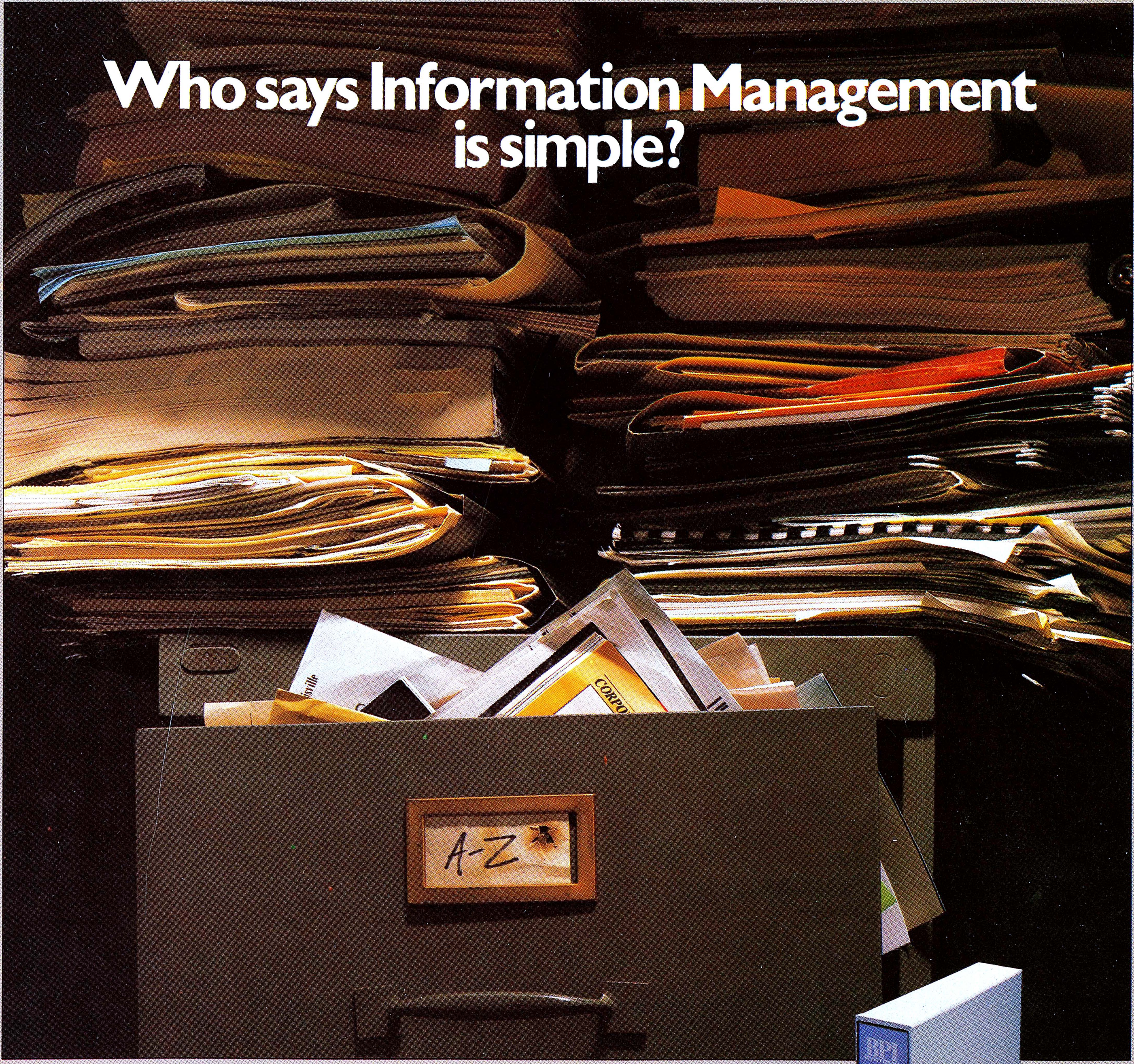

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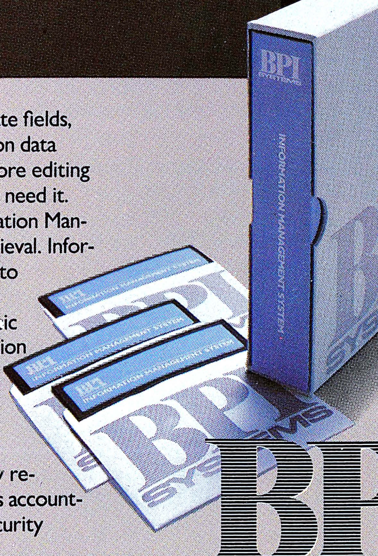

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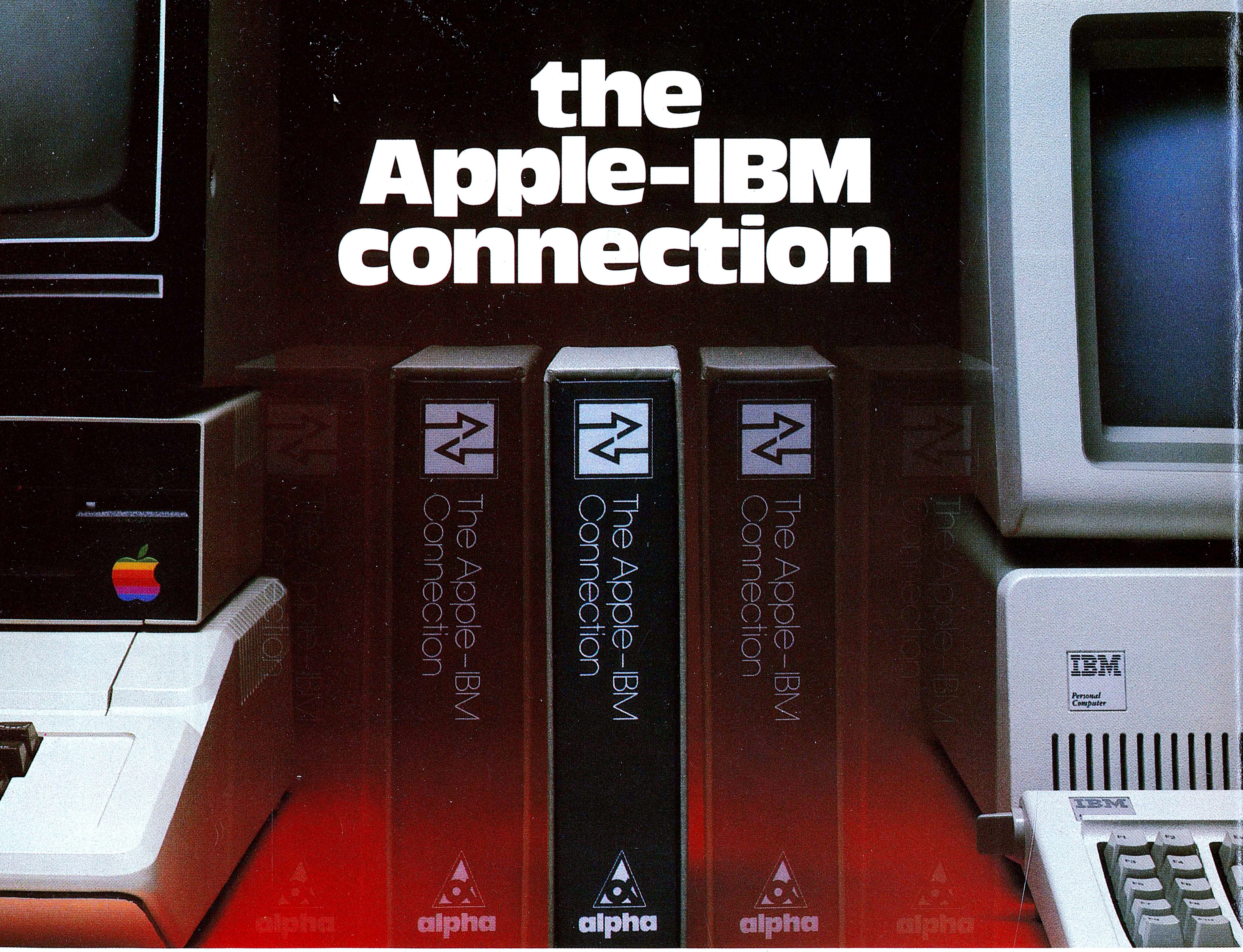

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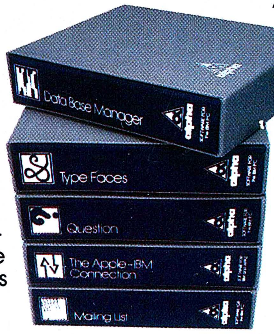

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softalk presents the bestsellers

Actually, folks, it was as easy as one, two. No matter that Mitch Kapor said it was as easy as one, two, three; it took only two months—well, thirty-two days—for *1-2-3* to hit the top of the IBM Personal Computer sales charts.

Buyer acceptance of the program borders on the mania produced in the Apple or Atari markets by a breakthrough in arcade-game programming. With the exception of isolated spots in the Midwest, where there's some price resistance, dealers can't stock *1-2-3* fast enough. One dealer was back-ordered the day after he received a shipment of forty units.

The general consensus is that *1-2-3* will have its greatest impact on spreadsheet programs, but those titles show no evidence of rolling over and playing dead. *VisiCalc* maintained third place in the Top Thirty, actually narrowing the gap between itself and former leader *WordStar*. *SuperCalc* dropped a couple of notches to seventh, but that's not serious unless the trend continues. And even *MBA*, considered most likely to suffer from the introduction of *1-2-3*, remains steady on the course.

Multiplan lost a little ground, but that's as much the fault of IBM for not shipping it as it is due to the competitive environment. Some dealers are getting around the shortage by buying the Compaq version, which is marketed directly by Microsoft, and selling it to pc owners. What's not the case is that IBM has pulled the product because of bugs in the code. Instead, there're kinks in the distribution lines. *Multiplan*'s current back order is in the four-digit range, which should cause the program to shoot up when IBM figures out how to get it to market.

Former leader *WordStar* is starting to get lots of heat from its word processing compatriots. *EasyWriter II* dropped to sixth, but held its position vis-a-vis *WordStar*. *EasyWriter 1.1* moved up to a tie for seventh and continues to show surprising strength in the new year. *Volkswriter* is also holding its ground versus *WordStar*, but all the frontrunners are being challenged by *Select*, which seems to be gaining ground steadily.

On the database front, *dBase II* seems to have attained a commanding lead, moving in February from eleventh to fifth. *PFS:File* entered the Top Thirty in the thirteenth position, an auspicious debut. Oddly enough, *TIM III* was helped, rather than hurt, by the competition. It rose to fifteenth from twenty-ninth the month before. *VisiFile* maintained its position.

Accounting packages in general did better in February. Perhaps the advent of a new contender, State of the Art, spurred interest. BPI's *General Accounting* jumped from twenty-first to fourteenth; State of the Art's *General Ledger* debuted in eighteenth, and Peachtree's *General Ledger* regained the list at twenty-fourth. In addition, the Peachtree *Accounts Receivable* package tied for twenty-eighth.

It's apparent, now that the holiday bloom is off the lily, that entertainment software will have tough sledding in the pc market. *Microsoft Flight Simulator* dropped to fourth and *PC Man* dropped to tenth. *FriendlyWare PC Introductory Set* tailed off a place to eleventh. *Zork I* dropped one position to fourteenth, *Deadline* dipped five places to nineteenth, and *Zork II* was off four spots in

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twenty-third. Generally, it's the case that text mode game software seems to be heartier than such graphics mode programs as *Snack Attack II* and *Adventure in Serenia*, both of which dropped off the list.

The picture for entertainment publishers wasn't enhanced by a relatively dreary sales month that provided heavy going for all but the top ten programs.

Yea though February was not a vintage month, it continued the recent trend toward wider choice on the software shelves. Fully 20 percent more titles were listed in February, a continuation of an auspicious trend that commenced after dealers realized they couldn't depend on IBM and their normal distributors for a wide range of software.

Most of the additional titles don't yet have national distribution, but at least they're now getting a chance to show their merit on a local or regional basis. That's an important step in the maturation of the pc marketplace.

For most software publishers, it's not only not as easy as one-two-three, it's not as easy as one through a hundred. After all, programs like *1-2-3* don't hit the streets every day. But when the dealer network opens itself to experimentation with the titles from unknown publishers it accomplishes two worthwhile goals: The software base is strengthened and the smaller companies get a chance at the brass ring.

You can check it out with Mitch Kapor. Nobody had heard of him when he wrote *Tiny Troll*, the forerunner of his *VisiTrend/VisiPlot*. ▲

the top thirty

This Month	Last Month	Index	
1.	9.	131.91	**1-2-3**, Mitch Kapor and Jonathan Sachs; Lotus Development
2.	1.	98.76	**WordStar**; MicroPro
3.	3.	89.09	**VisiCalc**, Software Arts/Dan Bricklin and Robert Frankston; VisiCorp, IBM
4.	2.	72.52	**Microsoft Flight Simulator**, Bruce Artwick; Microsoft
5.	11.	51.80	**dBase II**, Wayne Ratcliff; Ashton-Tate
6.	4.	46.27	**EasyWriter II**, Basic Software Group; Information Unlimited Software
7.	5.	37.29	**SuperCalc**; Sorcim
	12.	37.29	**EasyWriter 1.1**, John Draper; IBM (Information Unlimited Software)
9.	5.	36.60	**Home Accountant Plus**, Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Continental Software
10.	5.	34.53	**PC Man**, Greg Kuperberg; Orion
11.	8.	31.77	**Multiplan**, Microsoft; IBM
	10.	31.77	**FriendlyWare PC Introductory Set**, Michael D. Yaw, James J. Davis, Frank Smith, Alan Vanchura, John Leatherwood, and Bruce W. Moore; FriendlySoft
13.	–	26.93	**PFS:File**, John Page and D. D. Roberts; IBM (Software Publishing Corporation)
14.	13.	24.17	**Zork I**; Infocom
	21.	24.17	**General Accounting**, John Moss and Ken Debower; IBM (BPI)
16.	29.	21.41	**TIM III**; Innovative Software
	16.	21.41	**Microsoft Decathlon**, Microsoft/Tim Smith; IBM
18.	–	20.72	**General Ledger**, George Shackelford; State of the Art
19.	14.	19.34	**Deadline**; Infocom
	17.	19.34	**Volkswriter**, Camilo Wilson; Lifetree
	19.	19.34	**Norton Utilities**, Peter Norton; Peter Norton Inc.
22.	–	18.65	**IBM Pascal**, Microsoft; IBM
23.	19.	16.58	**Zork II**; Infocom
24.	–	15.88	**General Ledger**, Peachtree; IBM (Peachtree)
	15.	15.88	**Asynchronous Communications Support 2.0**; IBM
26.	23.	15.19	**MBA**; Context Management Systems
	–	15.19	**PC Tutor**, Lora Meise and Rick Lane; Comprehensive Software Support
28.	–	14.50	**Accounts Receivable**, Peachtree; IBM (Peachtree)
	29.	14.50	**VisiFile**, Creative Computer Applications/Colin Jameson and Ben Herman; VisiCorp
30.	17.	13.12	**Typing Tutor**, Michael Sierchio (Dick Ainsworth and Al Baker); IBM (Microsoft)

IBM Personal Computer sales outlets representing approximately 4.4 percent of all sales of pc and pc-related products volunteered to participate in the poll.

Respondents were contacted early in March to ascertain their sales for the month of February.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in March represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only for the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus or minus 5.1 percent, which translates roughly into the theoretical possibility of a change of 5.13 points, plus or minus, in any index number.

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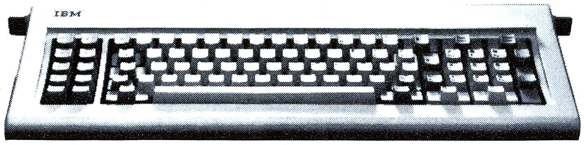

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